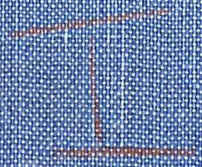

RURAL WATER SUPPLIES AND SETTLEMENT IN GEDAREF DISTRICT, SUDAN

Anne M. S. Graham

S U M M A R Y.

This research attempts to show how water supplies influence settlement patterns and affect the lives of cultivators in the northern margins of the central clay plain of Sudan.

An area of 7,000 square miles in Gedaref District was studied. Here rainfall is adequate for cultivation and the acacia-grassland vegetation is easily cleared, but development is hindered by inadequate supplies of drinking water. The region contains several distinct water environments, and a variety of peoples ranging from nomads, who occasionally cultivate, to settled agriculturalists with no beasts.

The area was studied throughout the year. Over two hundred villages were visited at least once. The adequacy and seasonality of the water supply from all water points was recorded. After preliminary reconnaissance, a village typical of each water environment was selected for further study. Several weeks were spent living in each of these villages, and when good relations were established, all the members of the village were interviewed individually in order to obtain more detailed information about life in the area.

In Gedaref, the nature of water supplies has resulted in an uneven distribution of population and a diversity of land use in an area of otherwise uniform physical characteristics. The ability to use such water as is potentially available limits the location of settlements, although the detailed siting of a village is the result of political, tribal and individual considerations. Moreover, although ways of life within the area vary according to the traditions of the people concerned, they are considerably influenced by the seasonality and unreliability of water supplies. In the past, man was generally less able to utilize the available water, and thus there were different settlement patterns and different ways of life, reflecting his more limited control over the environment.

CONTENTS.

CHAPTER I.

INTRODUCTION.

Over much of Africa water is the chief factor limiting development. Parts of the continent will probably never be utilized because it will not be economic to provide them with adequate water supplies. Both practical and technical considerations make it unlikely that much of the true desert will ever "blossom like a rose". It is at the margin that, in a much less spectacular way, small improvements in water supply, which are often both feasible and economic, can enable vast areas of land to be utilized. Here, at present, limited and scattered water supplies force imperfect use to be made of the resource base. Large acreages of potential grazing and agricultural lands lie idle, while often the population is forced to concentrate on the best-watered areas, so that locally soil resources are depleted through over-use. Permanent settlement may be impossible.

This problem of improving rural water supplies in areas where rainfall is adequate for their utilization, has received little academic attention except for an article by Dr. Dixey.[1] Probably

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1. Dixey, 1946.

because of their spectacular nature, attention has been focused on large-scale irrigation schemes. Yet the most easily-developed sites for these have now been used, and the expense of developing new ones is often prohibitive. By their very nature, these schemes benefit only one section of the population and frequently involve human problems of adjustments to new techniques and new environments, as they usually involve a considerable physical movement of population. Improvements in rural water supplies are usually much cheaper. Because of this, the governments concerned do not attract attention to their problems by requiring foreign capital. The benefits of rural water supplies can usually be spread over a larger area, thereby minimizing problems of regional discrimination. By their very nature they do not overthrow the existing way of life for the most part, but permit its physical extension with opportunities for economic improvement.

SUDAN.

In probably no other African country have improvements in rural water supplies been so marked as in Sudan in the last fifteen years.

In 1945 a new technique was found of mechanically digging hafirs, or unlined tanks, in impermeable clay soil. Traditionally hand-dug hafirs had provided temporary water supplies in areas where soil impermeability precluded shallow wells. Mechanized[1]

1a In Sudan mechanically-excavated hafirs are commonly called mechanized.

hafirs, quickly and economically constructed, are large enough to hold water all year, enabling permanent settlement to be established. Mechanized canalization permits a considerable extension of potential catchments, hand-dug, traditional hafirs having been confined to areas where run-off was naturally concentrated.

If new techniques revolutionized an old method of conserving water, deep bores enabled an entirely new source of water to be tapped. Moderate supplies of underground water are widely found in rocks of the Nubian Sandstone series, which, for the most part, underlie sandy soils to the north of the clays. In this area water supplies had previously been confined to shallow wells in the drift of wadi beds, where temporary perched water tables exist.

These new developments in water supplies have been made in an area known as the Central Rainlands of Sudan (fig. 1). Here the annual rainfall, which varies from about 400 to 800 mms., has always been adequate for some use to be made of the land either for grazing or for agriculture. Most of this area was previously underutilized because of lack of drinking water, but there were sporadic patches of over-exploitation where water supplies concentrated settlement. Between 1945 and 1961, 515 hafirs were excavated, together with 151 deep bores and 11 small dams.[2] If

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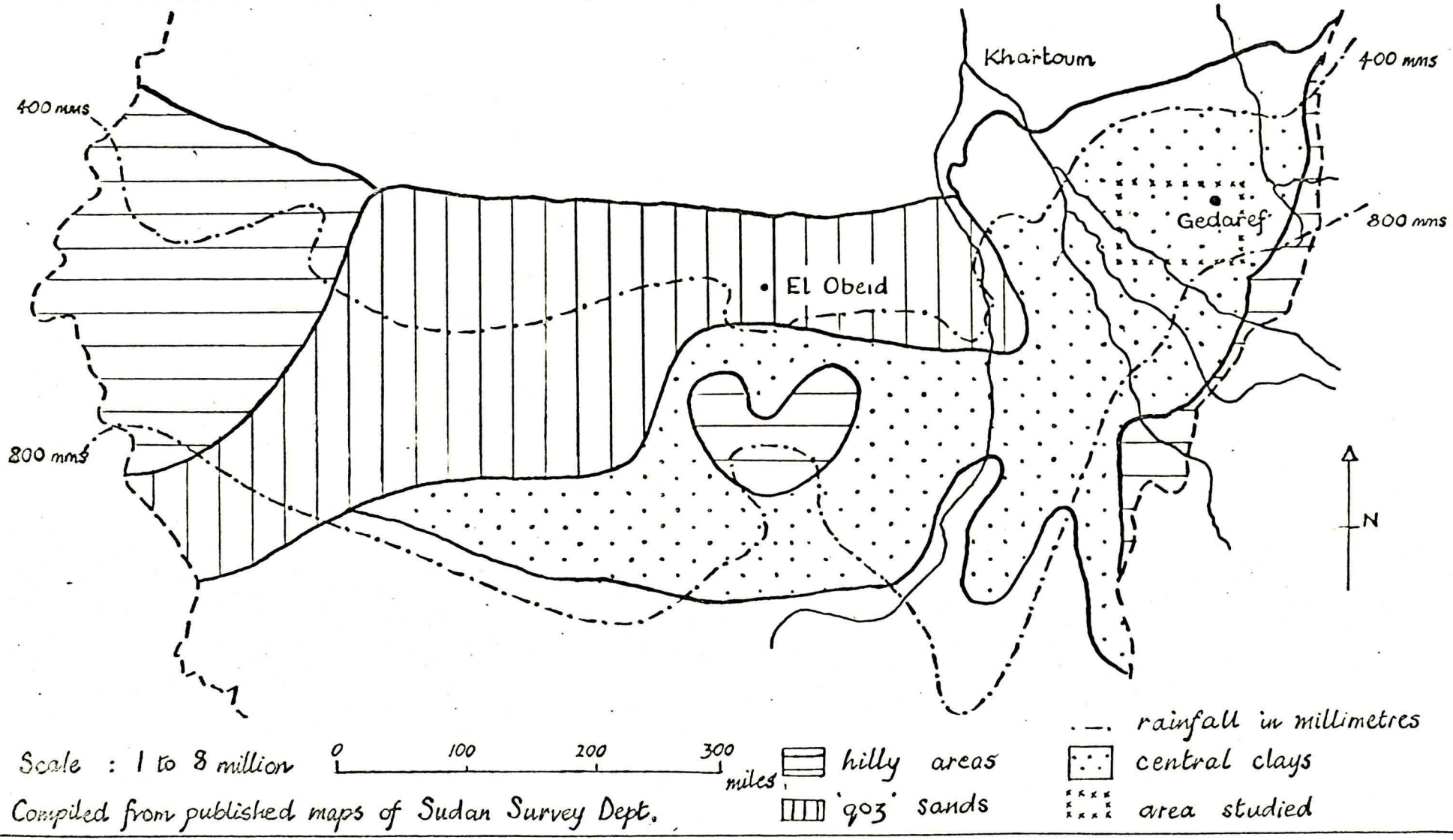
2. Bayoumi, 1962; p.11.

CENTRAL RAINLANDS OF SUDAN

FIG. 1



it is assumed that each of these enabled an area within a radius of six miles of it to be opened up,[3] an estimate which is rather modest in the light of the field evidence, they extended the area available for peasant cultivation and grazing by 48,300,000 feddans (1 feddan = 1·018 acres) as well as enabling 1,210,000 feds. to be developed under mechanized agricultural schemes. Even allowing for the fact that some of these new water points later failed and that others were established in areas where some seasonal use of the land was already being made, they enabled an area of about one fifteenth of Sudan to be fully utilized for the first time.

At the outset, the government, which was responsible for the construction of new water points, was preoccupied with the physical problems of construction and conceived of the provision of water in this land of scarcity as an end in itself, with too little thought for the consequences of their actions. The new water points were designed to spread grazing, agriculture and settlement. It was hoped, too, that, by reducing the population pressure around traditional water points, they would alleviate depopulation, overgrazing and overcultivation, but, as the Land Use Department has come to recognize,[4] their effect has often been to spread these problems. Without any form of extension service, traditional

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3. Bayoumi, 1962; p.11.
4. Bayoumi, 1962; p.5.

agriculture and husbandry have been carried into the areas of new water supplies, and the results show that the benefits of extending existing systems of land-use without recourse to modern techniques of soil and pasture conservation are often of doubtful value.

Settlement was normally as uncontrolled as land use, water points often being used for purposes for which they were not intended. Thus water points designed to enable herds to make temporary use of arid grazing were settled by villages who later found that the area was too dry for agriculture and that water was inadequate for year round use. Particularly in recent years, when some thought has been given to problems of over-cultivation, many water points have been established of such a low yield that they have been able to support only very small communities throughout the year. In these cases, it is not feasible to establish the services which it was hoped that additional water supplies and a permanent population would make practical. Moreover, water points which originally supported permanent settlement have frequently become inadequate for this purpose after several years. Either the water point's yield is reduced by inadequate maintenance or, alternatively, its early success has attracted too large a population. People who had been permanently settled by it are forced to resort to a migrant way of life, usually after a few years of increasing uncertainty. In other cases, new permanent

water points have encouraged nomads or transhumant herders to settle. This settlement is usually achieved only if the people are separated from their animals for part of the year, and, deprived of animal products, standards of nutrition and health may drop.

Thus, the establishment of these new water points has by no means resulted in the universal raising of living standards that was optimistically expected. Near the beginning of the hafir development programme Jefferson hinted that it might involve considerable social problems,[5] but even now when these problems are self-evident there has been no attempt to analyze them apart from an article by Lebon.[6]

While most water points are used for traditional methods of land use, some have enabled a completely new system of agricultural exploitation to be introduced. The mechanization of the production of dura (Sorghum vulgare Pers.), simsim (sesamum orientale Linn.) and cotton under general government supervision, has involved industrial problems of management and marketing, and labour difficulties akin to, but more extreme than, those found among small scale proprietors in the much more closely supervised irrigated areas. If the extension of traditional cultivation

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5. Jefferson, 1955; p.83.
6. Lebon, 1956;

created social strains, the imposition of this system of agriculture, so alien to the techniques of the African and his hoe, has created totally new human and economic problems.

GEDAREF DISTRICT.

Gedaref District, which lies in the eastern part of the Central Rainlands (fig. 1), was chosen as an area eminently suitable for a study of the human problems involved in changing traditional patterns of water supply. Not only does it contain deep bores as well as numerous mechanized hafirs, but the traditional water points are very varied in their origins, adequacy and reliability. In response to these water supplies, its peoples practise a wide variety of ways of life. They range from nomads who occasionally plant a crop, to settled cultivators with little interest in animal husbandry.

Gedaref District is an area of economic opportunity, and it lies at the eastern end of the great savanna migration route. Improvements in its water situation, therefore, not only affect the local population, but attract large numbers of West Africans as well as people from western Sudan. The result is that many of the new water points have attracted agriculturalists of very varied origin, causing the development of mixed rural societies unique in Africa.

In this area, too, lie most of the million odd acres of mechanized agriculture, with their annual influx of labour, and

the rather special type of new villages which have been established within them. The mechanized schemes, made possible by the same techniques of water supply that have facilitated the extension of peasant agriculture, have exerted a profound effect on the traditional economy of the area.

AIMS OF RESEARCH.

Basically, the aim of the research was to study the influence of limited and unevenly distributed water supplies on life and settlement in the area. This involves an investigation of how changes in man's ability to exploit the potential water resources have caused settlement patterns to change. The speed at which, and the methods by which, settlement patterns alter in response to the opening up of new water points or the failure of old is studied. An investigation has been made of the extent to which limited water supplies influence ways of life in the area, bearing in mind that these are also the product of varied tribal heritages. It includes a study of the different occupations of the main tribal groups and the effect of these upon their water requirements, which in turn influences their choice of water supplies and therefore affects their distribution throughout the area.[7]

THE AREA STUDIED.

The area studied consists of a rectangle of about

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7. See Appendix A for methods of research.

7,000 square miles in the central part of Gedaref District, and contains over 230 villages. According to the 1955 Population Census it has a rural population of about 98,000. It includes the administrative centre of Gedaref Town and is traversed by the railway (fig. 2).

It is bounded on the west by the R. Rahad and on the east by the empty clay plain beyond the Gedaref ridge, on the north by the increasing aridity which terminates permanent settlement and on the south by an area of rapidly decreasing population which merges into the uninhabited game reserve near the Ethiopian frontier.[8]

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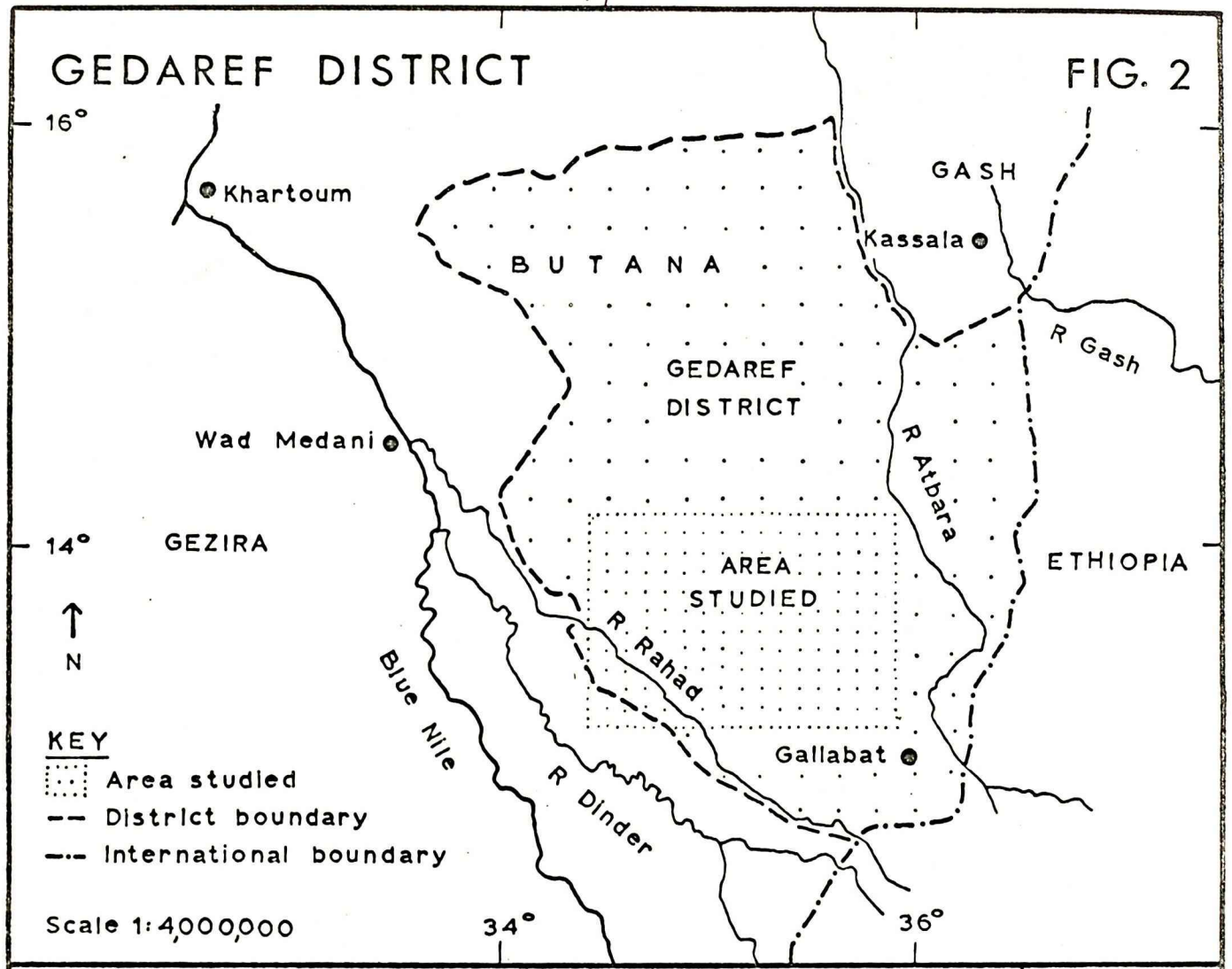
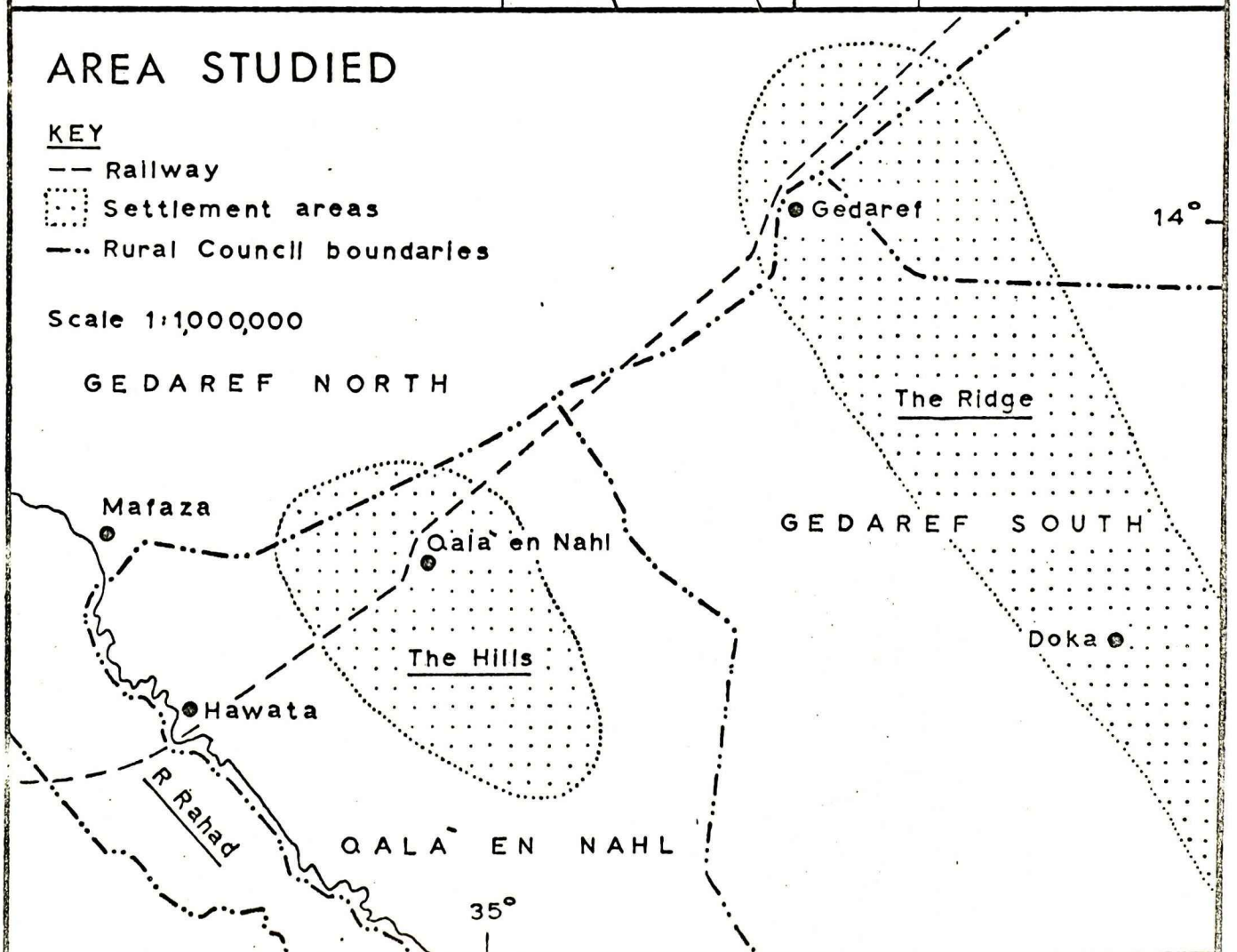
8. Beyond the string of villages bordering the Rahad lies a stretch of unsettled, waterless plain which extends to the R. Dinder, which has a settlement pattern very like that of the Rahad and was therefore not studied.

To the east there is a similar stretch of clay plain beyond the Gedaref ridge. Although partially utilized for mechanized agriculture, few water points or settlements exist. When settlement begins again it is along the banks of the Atbara. This river, because of its greater size, incised nature and general absence of gerf land forms a sharp contrast to the Rahad. This might have been a reason for including it as one of the water environments studied. However, water supplies along the river are not sufficiently localized to influence the siting of settlements. Moreover, because of the generally adequate water supplies of the Gedaref ridge, and the considerable distance between the ridge and the Atbara, the ridge is not very dependent on the river and Ridge-Atbara relations are not nearly as close as relations between the Nahl hills and the R. Rahad. In addition, with regard to the origin of immigrants and age distribution of villages, the settlement pattern along the


GEDAREF DISTRICT
FIG. 2
16°
Khartoum
BUTANA
GASH
Kassala
R Gash
GEDAREF
DISTRICT
R Atbara
Wad Medani
14°
GEZIRA
AREA
STUDIED
ETHIOPIA
N
R Rahad
Blue Nile
R Dinder
Gallabat
KEY
Area studied
District boundary
International boundary
Scale 1:4,000,000
34°
36°


AREA STUDIED
KEY
Railway
Settlement areas
Rural Council boundaries
Scale 1:1,000,000
GEDAREF NORTH
Gedaref
14°
The Ridge
GEDAREF SOUTH
Mafaza
Qala en Nahl
The Hills
Doka
Hawata
R Rahad
QALA EN NAHL
35°

The most widespread physical feature of the area is the clay plain, gently sloping to the west. Its monotony is broken by two groups of low hills, in the west the granite-serpentine rocks of Qala'en Nahl, in the east the basalt ridge of Gedaref overlying Nubian sandstone.

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8 (cont.) Atbara is very like that of the Rahad, although the Fulani rather than the Hausa are the dominant West African group. For these reasons the R. Atbara was excluded from this study.

Beyond the northern boundary of the area, there are no permanent settlements. The rocky outcrops of the Gedaref ridge and the Nahl hills lie to the south. Mechanized agriculture extends a short distance beyond the boundary, but yields from these northerly schemes and from the scattered patches of agriculture practised by nomads in depressions are very uncertain, particularly in the west. Along the Rahad the boundary cuts the continuous belt of riverine settlement, a couple of miles beyond the most northerly dry season camp of the people from the Nahl hills.

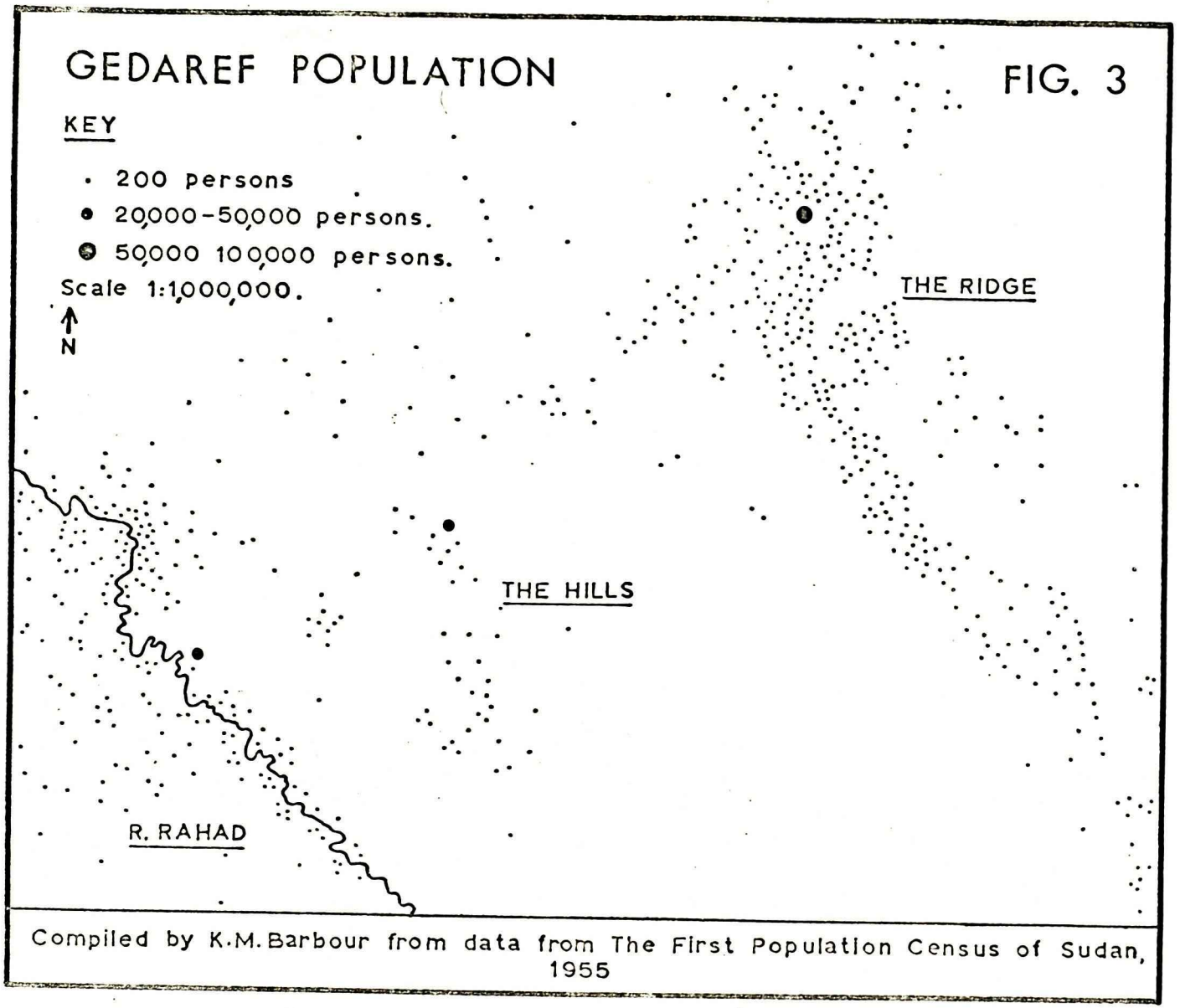
In the south, the boundary lies just beyond their most southerly dry season camp, passing south of the hills themselves. In this part of the region there are no settlements lying outside the boundary of the area studied. The boundary cuts across the Gedaref ridge at a point where the ground becomes undulating, and the crest of the ridge becomes almost indistinguishable from the surrounding rolling clays. There are a few scattered villages between here and the Ethiopian border, but they are not sited with particular reference to the ridge, and they suffer from no shortage of water supplies. A very low percentage of the area is devoted to agriculture and because of the higher rainfall fields are markedly smaller and crops more varied than in the rest of the district.

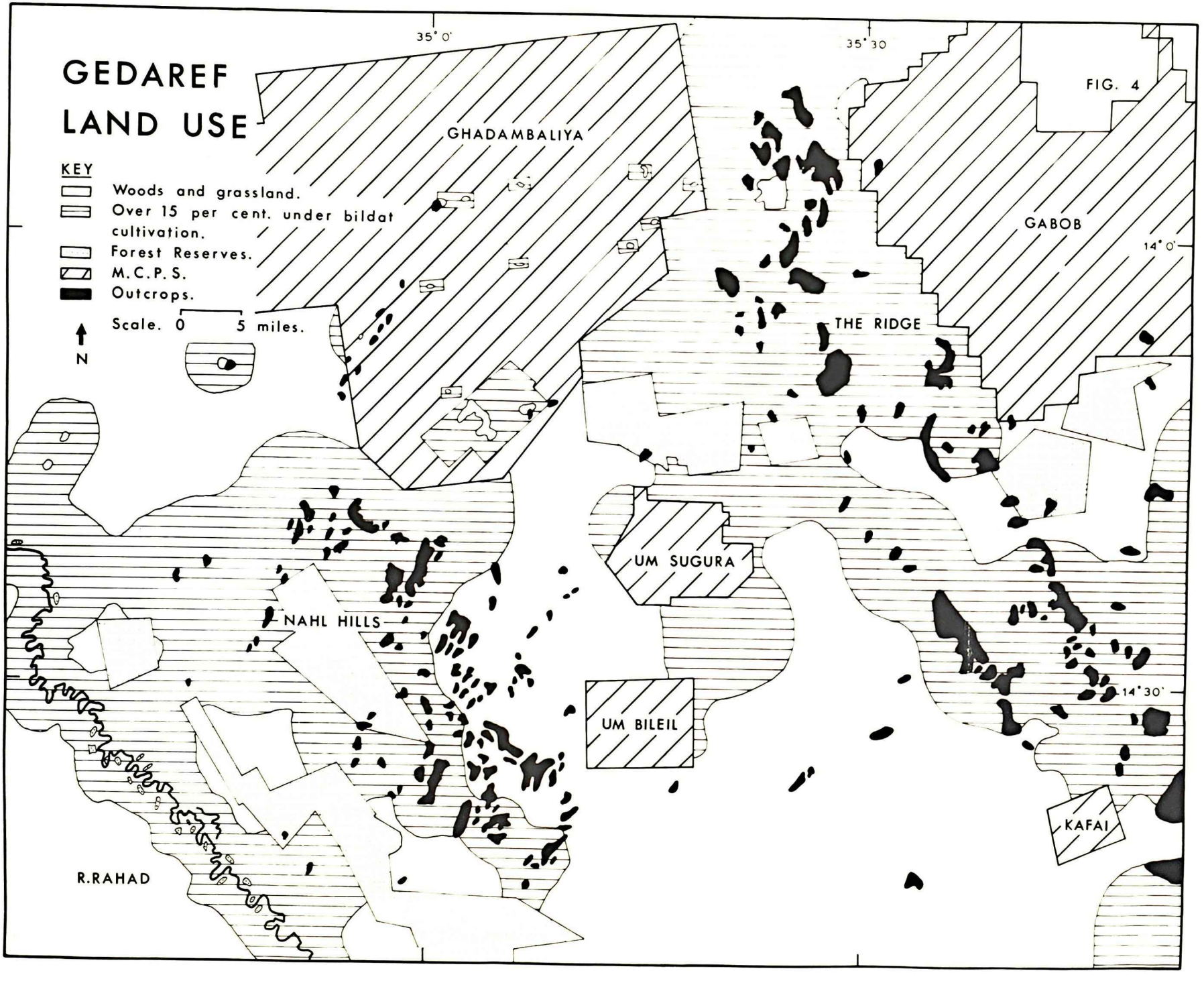
The clay soils of the area are remarkably resistant to exhaustion and erosion, and this, together with the fact that the acacia-grassland vegetation is easily cleared, makes the area one of considerable agricultural potential. The rainfall of 450-700 mms. is almost everywhere adequate for cultivation, but development is hindered by inadequate supplies of water for drinking purposes.

Because of its impermeability there are no sub-surface water supplies in the clay plain, and percolation is confined to the zones around rocky outcrops. Villages cluster tightly at the foot of hills, where well water is available, or are strung out along the semi-permanent water course of the Rahad. These three nuclei of settlement, with their peripheral cultivated areas are separated by vast stretches of empty clay plain.

Thus the absence of water supplies has resulted in a very uneven distribution of population (fig. 3) and a diversity of land use in an area of otherwise uniform physical characteristics.

Recently, with the technique of using machinery to dig reservoirs or hafirs in the impermeable clay, the area over which water is available has greatly increased. Much of the once forested plain is now under large scale cultivation (fig. 4). However, partly because the labour demands of this kind of agricultural production are very seasonal, and partly because of the uncertainty of the hafirs' filling or holding water


GEDAREF POPULATION
FIG. 3
KEY
200 persons
20,000-50,000 persons.
50,000 100,000 persons.
Scale 1:1,000,000.
N
THE RIDGE
THE HILLS
R. RAHAD
Compiled by K.M.Barbour from data from The First Population Census of Sudan, 1955


GEDAREF
LAND USE
KEY
Woods and grassland.
Over 15 per cent. under bildat cultivation.
Forest Reserves.
M.C.P.S.
Outcrops.
Scale. 0 5 miles.
N
35° 0'
35° 30
FIG. 4
GHADAMBALIYA
GABOB
14° 0'
THE RIDGE
UM SUGURA
NAHL HILLS
UM BILEIL
14° 30'
KAFAI
R.RAHAD

throughout the year, these new water points have attracted relatively few settlers. Basically the traditional settlement pattern is still unchanged.

The endless monotony of the clay plain dominates the landscape. Dark brown, almost black in colour it is deeply cracked and bone-hard in summer, swelling to a glutinous impassable mire in the rains. In the north it is covered with short annual grasses which dry to a silvery grey. The scattered thorn bushes concentrate to form dense thickets along the meandering lines of seasonal watercourses.[9] In the south there are tall, coarse perennial grasses, straw-like in texture, and open forests of deciduous acacia, bronze-barked talih, rugged higlig, sufar with its milk-coloured trunk, and the gnarled grey stunted form of the valuable hashab (fig. 5). The bald granite domes of Beila and Ban rise abruptly above the plain, the smooth surfaces of their massive boulders devoid of vegetation. In contrast there are the flat-topped ranges of Qala'en Nahl and the Gedaref Ridge, their gentle scree slopes covered with habil and luban, which spring into pale green leaf with the first hint of rain. The villages which cluster on the red sands of the pediment at the foot of these hills are unassuming in appearance. They consist of a tight cluster of round huts of wattle or mud, with shaggy,

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9. See Appendix B for botanical list of common tree species found in the area.

FIGURE 5 VEGETATION

North

South

Hashab(gum trees)retained when clearing a field

grass-thatched roofs, and creaking doors of flattened petrol tins. Amid this somewhat dishevelled housing, the corrugated iron or "zincy" of the village shop shines brightly in the sun.

CHAPTER II.

PHYSICAL BACKGROUND.

(i) CLIMATE.

Almost all the sources of water supply in Gedaref are dependent on annual rainfall within the area for their replenishment. The water in most rock pools or gallits lasts only two or three months after their being filled. Many shallow wells ~~and bores~~ contain almost no water seven or eight months after the last rains. Even bores are dependent on rainfall for their replenishment, although the slowness of percolation through several hundred feet of sandstone evens out fluctuations in recharge.

Gedaref's rainfall is typical of those semi-arid parts of Africa which lie north of the Equator and west of Ethiopia. Rain is essentially seasonal, being associated with the northward movement of the intertropical convergence zone, during the high sun period in summer.

Most of the rain falls in June, July, August and early September. Showers in late April or May, associated with the advancing wedge of the intertropical convergence zone are not uncommon, but the main rains come when it has passed northward and the front is several thousand feet deep over Gedaref. There

may also be scattered showers in October, but only in four out of the last fifty years has rain fallen between October 30th and April 1st (fig. 6).

Rainfall decreases from south to north, in accordance with the pattern prevailing in saharan Africa. Over most of the continent isohyets are parallel to lines of latitude, but in Gedaref they swing northwards towards the east where rainfall increases because of the proximity of the edge of the Ethiopian plateau, which lies only 140 miles from Gedaref town. The north-west of the area studied probably has a mean annual rainfall of about 470 mms. whereas a hundred miles to the south-east it is probably about 700 mms. (fig. 7).

Within Gedaref rainfall seems to be convective rather than orographic. Few hills in the area rise more than 150 metres above the plain, and such evidence as exists seems to suggest that topography plays no part in the distribution of local rainfall. Clouds do not appear to form more readily over the hill masses, and Gedaref town, on the crest of the ridge, has a rainfall no higher than that of comparable stations in the clay plain (see fig. 7).

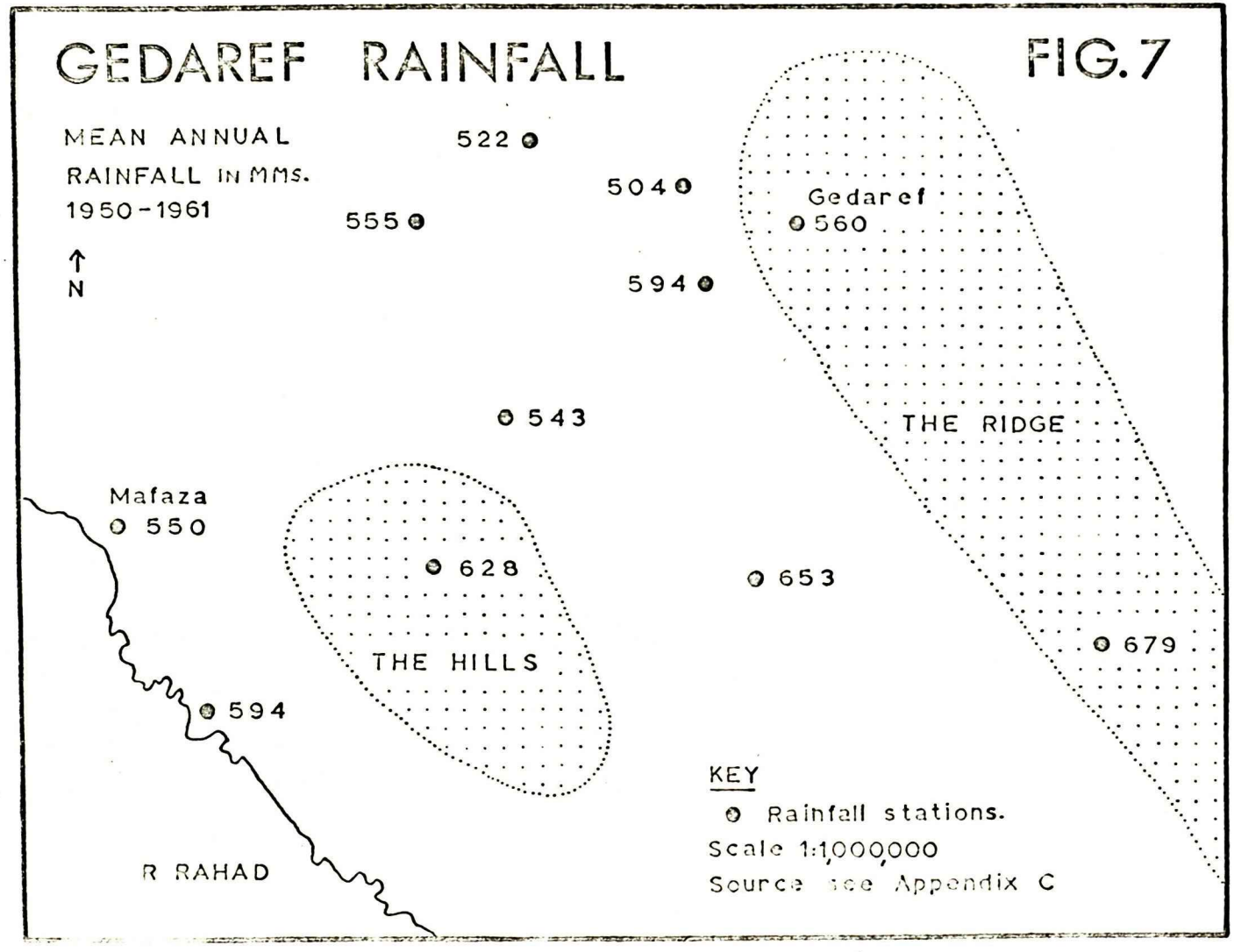
Mean temperatures are high. The highest occur in April and May when the sun is overhead; the lowest in August at the height of the rains, when sun temperatures are reduced by cloud cover and

FIGURE 6.

GEDAREF TOWN. MEAN MONTHLY METEROLOGICAL DATA.

(Sudan Standard Period 1921 - 1950.)

	J.	F.	M.	A.	M.	J.	Jl.	A.	S.	O.	N.	D.
Temperature (C)												
Daily Maxima	35·1	36·2	38·3	40·2	39·2	36·9	32·9	30·8	32·6	36·6	37·0	35·8
Daily Minima	17·4	17·8	20·4	23·5	24·1	22·9	21·6	20·7	21·0	21·3	20·9	18·1
Rainfall (in mms.)	0	0·3	0·9	7·4	35·3	97·7	184·6	209·5	113·5	26·0	4·7	0
Relative Humidity (per cent. at 8a.m.)	50	44	32	26	40	56	72	80	74	54	40	46


GEDAREF RAINFALL
FIG.7
MEAN ANNUAL
RAINFALL IN MMS.
1950-1961
N
522
504
555
Gedaref
560
594
543
THE RIDGE
Mafaza
550
628
653
679
THE HILLS
594
R RAHAD
KEY
Rainfall stations.
Scale 1:1,000,000
Source see Appendix C

evaporation of rainfall. Winter temperatures do not fall below 35° Centigrade (see fig. 6).

The relative humidity varies considerably. In April when the winds are blowing from the northern deserts it reaches a minimum of 26 per cent. (at 8 a.m.). In May, with the coming of the South-east Trade Winds associated with the intertropical convergence zone it rises to 40 per cent., increasing to a maximum of 80 per cent. in August at the height of the rains. Evaporation at Gedaref is estimated to be 2·28 metres per annum, but it is greatest in the dry season when it is responsible for heavy losses of water from the surfaces of hafirs (see fig. 6).

CHARACTERISTICS OF RAINFALL.

The mean annual rainfall map of Gedaref (see fig. 7) is of comparatively little use. This is partly because of the inadequacy of the data from which it is compiled,[1] and partly because of the very limited value of the concept of the mean, because of the wide fluctuations about it. During the last fifty years Gedaref's rainfall has varied from 64 per cent. to 160 per cent. of the mean (fig. 8). Drier stations with a lower mean rainfall show greater variations about the mean particularly at the lower end. Thus, over the same period, the rainfall for the driest year at

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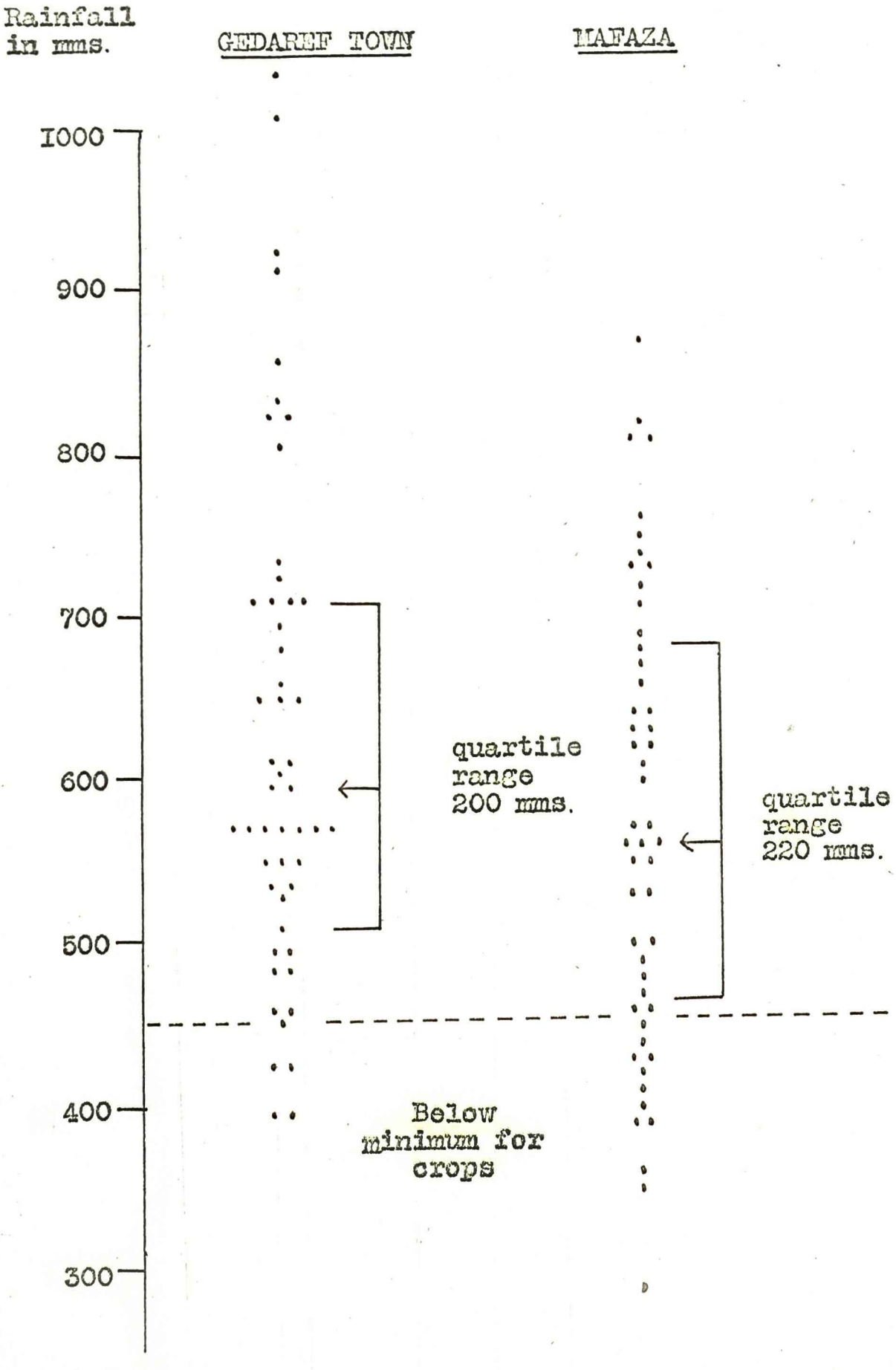
1. See Appendix BC.

FIGURE 8

VARIABILITY OF TOTAL RAINFALL (1910-1960)



Mafaza was only 49 per cent. of the mean. Moreover, in both cases the mode lies 30-40 mms. below the mean, so that the chances of obtaining a rainfall greater than the mean are considerably less than 50 per cent.

Not only is total rainfall variable from year to year, but within any one year there are enormous variations from place to place. For example in 1951 there was a 270 mm. difference in rainfall between two stations only seven miles apart. One had 616 mms., the other 348 mms. (fig. 9). This variation seems to be random. One year one station will be low in relation to its neighbours; the next year it may be high. This is clearly shown if the relative positions of stations in the Mechanical Crop Production Schemes (M.C.P.S.) are compared for 1950 and 1951 (fig. 10). These wide variations are probably mainly the result of the convective nature of the rainfall, combined with winds of considerable force but variable direction.

Variations in total annual rainfall are, however, small compared with variations in the date at which the rains commence. For purposes of illustration, let the first rainstorm of over 5 mms. be taken as marking the beginning of the rainy season. In Gedaref Town over the last fifty years its occurrence ranged from a freak storm on February 1st to ~~a couple of~~ five years when the

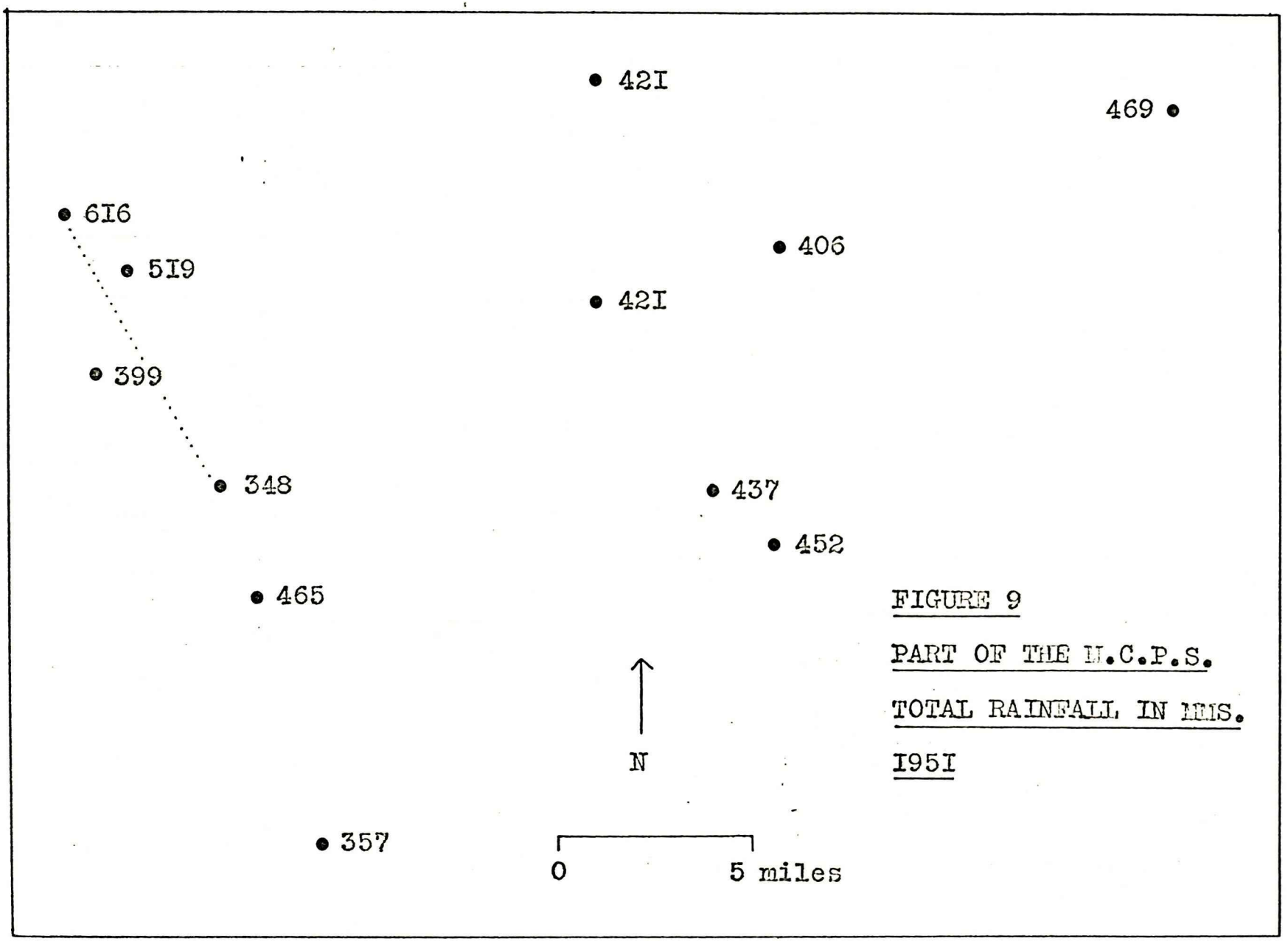


FIGURE 9

PART OF THE U.C.P.S.

TOTAL RAINFALL IN MMS.

1951

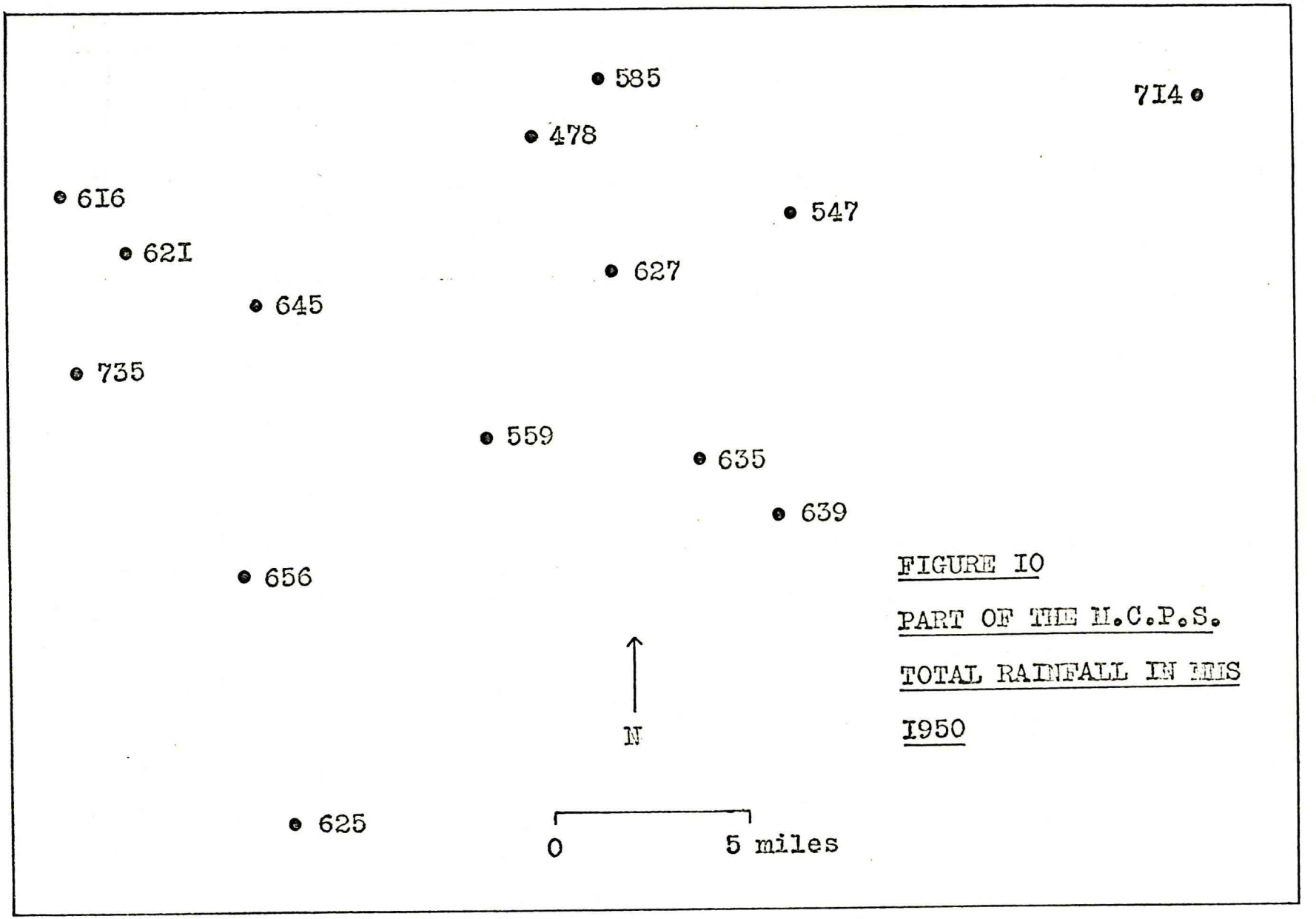


FIGURE IO

PART OF THE H.C.P.S.

TOTAL RAINFALL IN MMS

I950

first significant rains did not occur until after June 20th. In 50 per cent. of the years, however, the first rains of over 5 mms. fell between May 4th and May 26th (fig. 11).

The first significant rains also vary from place to place in the same haphazard way as total rainfall. A difference of a fortnight or so in the first significant rains falling on two places five miles apart is quite usual. Figure 12 shows a difference of nearly two months between two stations only seven miles apart, differences of this size being by no means uncommon.

EFFECT OF RAINFALL ON AGRICULTURE.

Since rainfall is the main source of water for both agriculture and drinking its seasonal and variable nature has an important influence upon life in the Gedaref area.

Dura (Sorghum vulgare Pers.), the staple food crop of the area, normally requires a minimum rainfall of 450 mms. to reach maturity.[2] Mean annual figures for the area, as far as they are available, exceed this amount. But because of the variability of rainfall, crop failures as a result of drought are quite common except in the far south. In Gedaref Town, over the last fifty years, rainfall has twice fallen below 450 mms. At Mafaza to the ~~north~~-east rainfall has been adequate in only 41 (or 82 per cent.) of the years. Further to the north-east the situation is worse.

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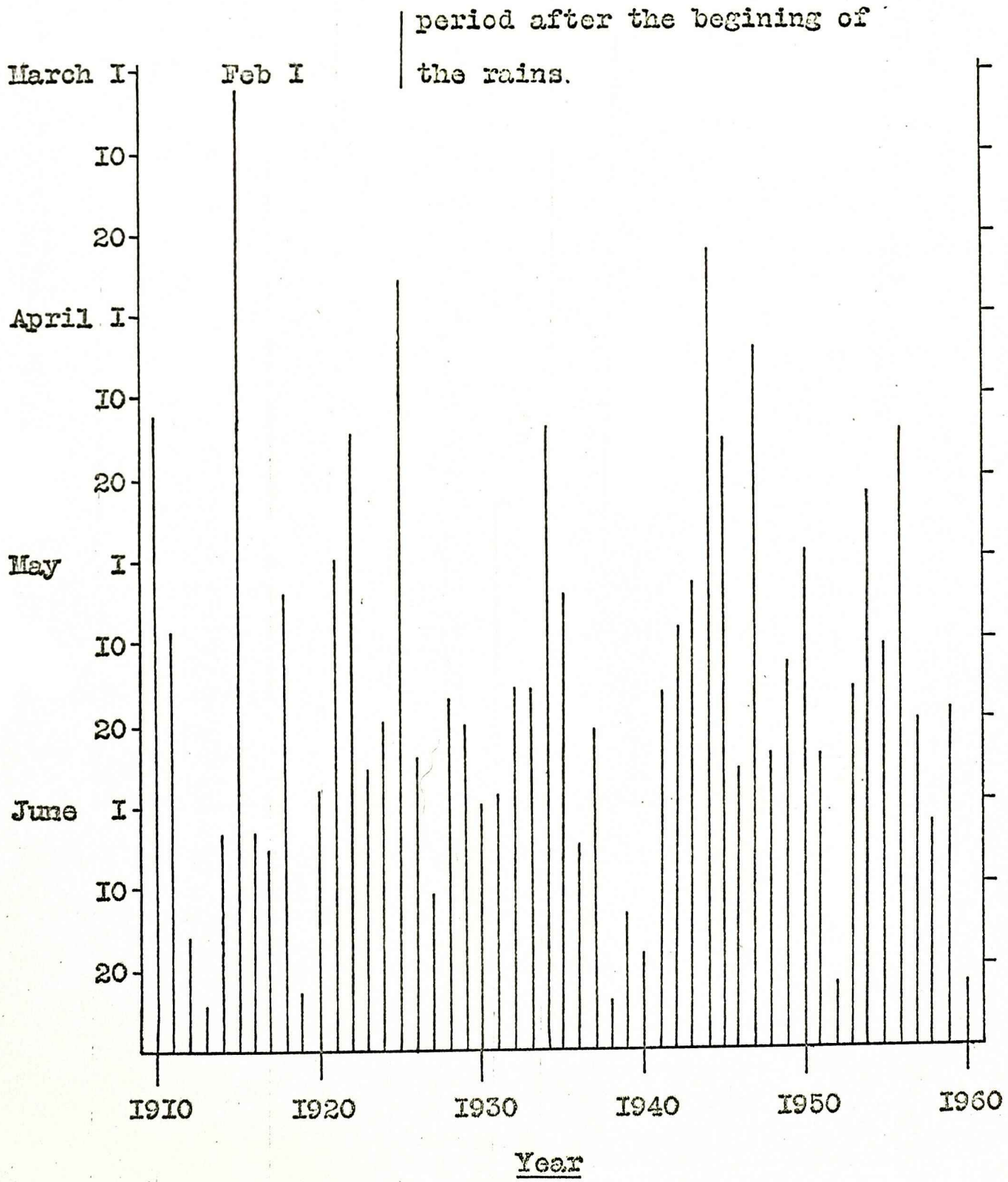
2. From information supplied by the Ministry of Agriculture, Khartoum.

FIGURE II

GEDAREF TOWN. DATE OF THE BEGINING OF THE RAINS.

Date of first rainfall of over 5mms



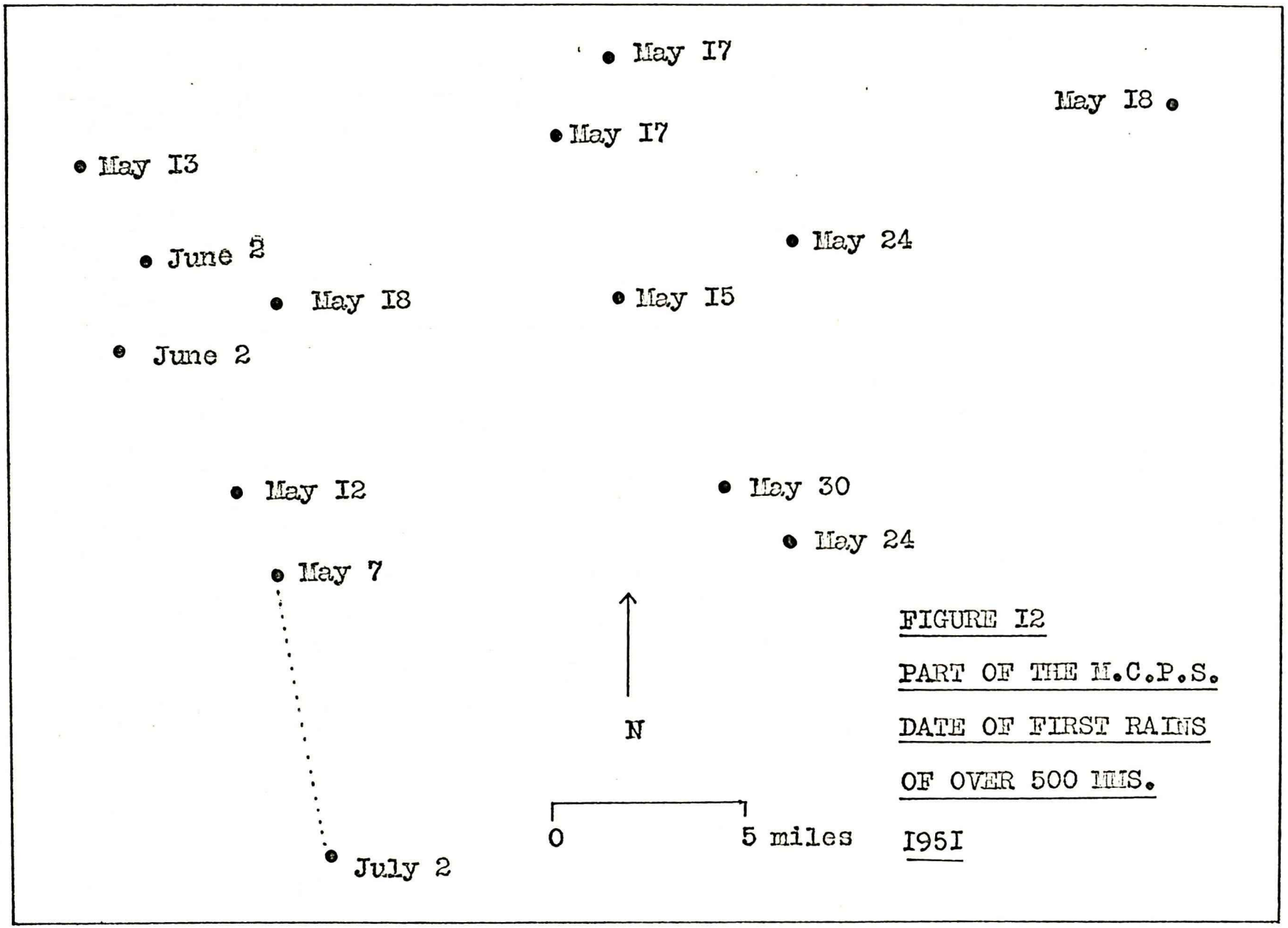


FIGURE 12

PART OF THE M.C.P.S.

DATE OF FIRST RAINS

OF OVER 500 MMS.

1951

Cultivators cannot assume that there will be enough rain to cultivate areas of flat ground. Instead they plant in slight depressions where rainfall is augmented by run-off.

Unusually heavy rain may be as detrimental to crops as inadequate rain. If rainfall exceeds about 700 mms dura yields are severely reduced. Simsim (Sesamum orientale Linn), an oil seed plant, prefers a heavier rainfall than dura. Most farmers therefore plant both crops in order to insure against this variability of rainfall. Over most of the area, except in a year of exceptional drought, one crop at least will grow well.

The irregular nature of the first rainstorms also affects agriculture. Several fairly heavy storms a few days apart are necessary to make the soil wet enough for planting. Unfortunately these storms may be followed by a period of drought before the onset of the main rains and the young seedlings may die. Moreover, as many farmers are anxious to reap the high prices of an early harvest, they plant as soon as the soil is wet enough to germinate the seed, hoping that further rain will come soon. In a year when the first rains are poorly spaced the impetuous farmer may have to replant several times before the rains become steady and regular enough to support the seedlings.

The variability of rainfall from place to place makes farm

incomes liable to considerable fluctuation. If drought were always widespread, poor yields would be in part compensated for by the higher prices that would result from general shortage of grain supply. Often here, however, drought may cause one village's crops to fail, while neighbouring villages have adequate rains and good yields. There is no general shortage of grain so that the distressed villagers receive a low unit price for the small quantity of produce that they manage to put on the market.

EFFECT OF RAINFALL ON WATER SUPPLIES.

Both annual rainfall totals, and the distribution of the rains affect water supplies. Total annual rainfall is particularly important for wells and jamams.[3] For example, there seems to be a six or seven week variation in the date when granite wells dry up depending on the size of the total rainfall during the previous year. In 1960 rainfall was about 25 per cent. less than the average and the next year wells dried about five weeks earlier than usual.

Total rainfall is not usually so important in the case of hafirs. Open-ended horseshoe-shaped hafirs, which are fed by direct run-off from a hill, will almost certainly receive enough water whatever the rains are like. In 1960 there were a few that were not completely filled but they dried out only about ten days

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3. These are shallow unlined pits, only 2 or 3 metres deep, from which underground water is obtained.

earlier than usual. In the case of hafirs which are sited in the plain and fed by a stream, the way in which the rain falls is more important than total rainfall. A severe storm is required to make most watercourses flow. To be filled a hafir needs several very heavy storms. It does not matter if these are irregularly spaced or if total rainfall is low, although an examination of the records shows that storms of this magnitude are more likely to occur during years of heavy total rainfall.

To a lesser extent the severity of storms and showers affects wells. This is especially true at the beginning of the rainy season. At this time temperatures and therefore evaporation rates are high. A high proportion of rain from an early shower will be lost by direct evaporation. Much of the rest, retained in the top few inches of soil, will be lost later by evaporation following capillary action. Where showers are small and occur with several days between them there may be no water available for percolation. If the storm is very large a smaller percentage will be lost through evaporation, but long before the rain has stopped the surface soil may become saturated and water potentially available for percolation may be lost through run-off. The extent to which this will occur depends on the nature of the surface soil. Where this consists of coarse weathered debris at the foot of a hill,

percolation is rapid and there is little waste through run-off. On clay, however, saturation and swelling occur so swiftly that once surface cracks are closed there is almost no percolation. (This is why there are few wells on the clays and why those that exist seldom contain much water.) Generally, moderately heavy showers provide the highest percentage of rain for percolation. Ideally, they should be evenly spaced in time so that the surface soil does not have time to dry out between showers. In 1961 the wells at Doka did not contain an appreciable amount of water until August. Yet by July 31st, 175 mms. of rain had fallen. The reason was that over half the total rain had fallen in widely spaced showers of less than 10 mms. and had not contributed towards percolation.

Although the first few showers have little effect on raising the water table in wells, they are none-the-less immensely important as sources of drinking water. These showers come at a time when many people from the Nahl Hills are living away from home because their wells have dried up. They are anxious to return to their villages as soon as possible to clean their fields in preparation for the next agricultural season. Often there are gallits or rock pools in the granite hills close to their villages. These rock pools fill by direct run-off after the first shower. When this happens the men of the village can return to prepare their

fields up to a month sooner than if they had to wait for water in their wells to rise. When the gallits fill unusually early their water may all be drunk before heavier rains come, causing the wells to rise. If this occurs the men who have returned to their villages to clean their fields may have to go back to their dry season camps. Where the first showers occur late in the year they may be followed almost at once by the main rains and the gallits are barely used. This happened in 1961 when the rains were very late and the first storm which filled the gallits was so heavy that in many places it caused wells to rise and hafirs to fill as well.

EFFECT OF RAINFALL ON WAY OF LIFE.

The variation in total rainfall and in rainfall variability between the north-west and south-east of Gedaref has a considerable effect on the life led in the different parts of the district.

The far north-west of the area contains few villages and is mainly used by nomads. Even where granite hills are available for siting wells and hafirs the rainfall is likely to be too low for these to contain water for more than a few months each year. Moreover, when only small scale agriculture in depressions can be carried out there is little inducement to settlement. Admittedly few granite wells hold water all the year anyway, but at least, further south, they hold water for longer periods and together with

hafirs can support a transhumant or even a settled population.

Further west, of all the villages on the basalt ridge only those more than twelve miles north of Gedaref Town are so short of water that they have to migrate to the Atbara in the dry season. Thus within any one rock type those villages in the low rainfall areas of the north and north-west are forced to practise a more marked seasonal movement than those to the south.

Rainfall variability for the north of the area is about 15 per cent. whereas in the south-east it is 12·5 per cent. Thus in both the north and the south of the area people have to be able to cope with unusual water shortages. Indeed, those living in the north are for the most part already nomadic or transhumant and it is fairly easy for them to adapt to unusual drought or plenty, compared with the more settled people of the south.

Much of the north of the area (though not the extreme north-east) is underlain by Nubian sandstone, and it might seem that some of the problems of shortage of water in the north might be overcome by drilling bores. Many of the bores in the north of the area have failed to produce water at all, or have dried up after the first few months of operation. It seems that in the far north rainfall may be too low for there to be percolation into the bore. The Tudor Engineering Company[4] estimate that there may be little

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4. Tudor Engineering Company, 1959; p.34.

recharge of groundwater in areas with less than 500 mms. mean annual rainfall. In Gedaref there are two bores in areas of about 550 mms. rainfall which have been producing water for several years but, although there seems to be some recharge as they continue to provide water, yields have always been low compared with bores in the south.

CONCLUSION.

Local rainfall, together with physiography which will be described next, form the most important physical factors influencing the use to which Gedaref district is put. Rainfall plays an important part in the distribution of population, in the kind of settlement adopted and in the way of life throughout the area.

(ii) PHYSIOGRAPHY.

Man's ability to extract and conserve the water made available by rainfall depends largely on the nature of the surface drift and the underlying rock structure.

GEOLOGY.

The Gedaref area is underlain by four main rock groups. There are those of the basement complex, the Nubian sandstone series, tertiary basalts and the alluvial deposits of the Atshan series (fig. 13).

Basement complex. Rocks of the basement complex underlie the whole area, and indeed most of Sudan. Probably pre-Cambrian in age, they consist of igneous and metamorphic rocks. They lie directly below superficial deposits in half the area studied. The basal schists, which are the most widespread rock type, the gabbros and the volcanic rocks have been much eroded and generally form low ground. The rocky outcrops, which are so important as sources of water supply, consist mainly of two groups of ultra-basic rocks and two batholiths. The ultra-basic rocks occur at Qala'en Nahl and Um Sagata in the south. They consist mainly of serpentine. The massive batholith of Beila is of granite gneiss, while the more fragmented hills of the Balos area are of granite (fig. 14).

Nubian sandstone series. Rocks of the Nubian sandstone series

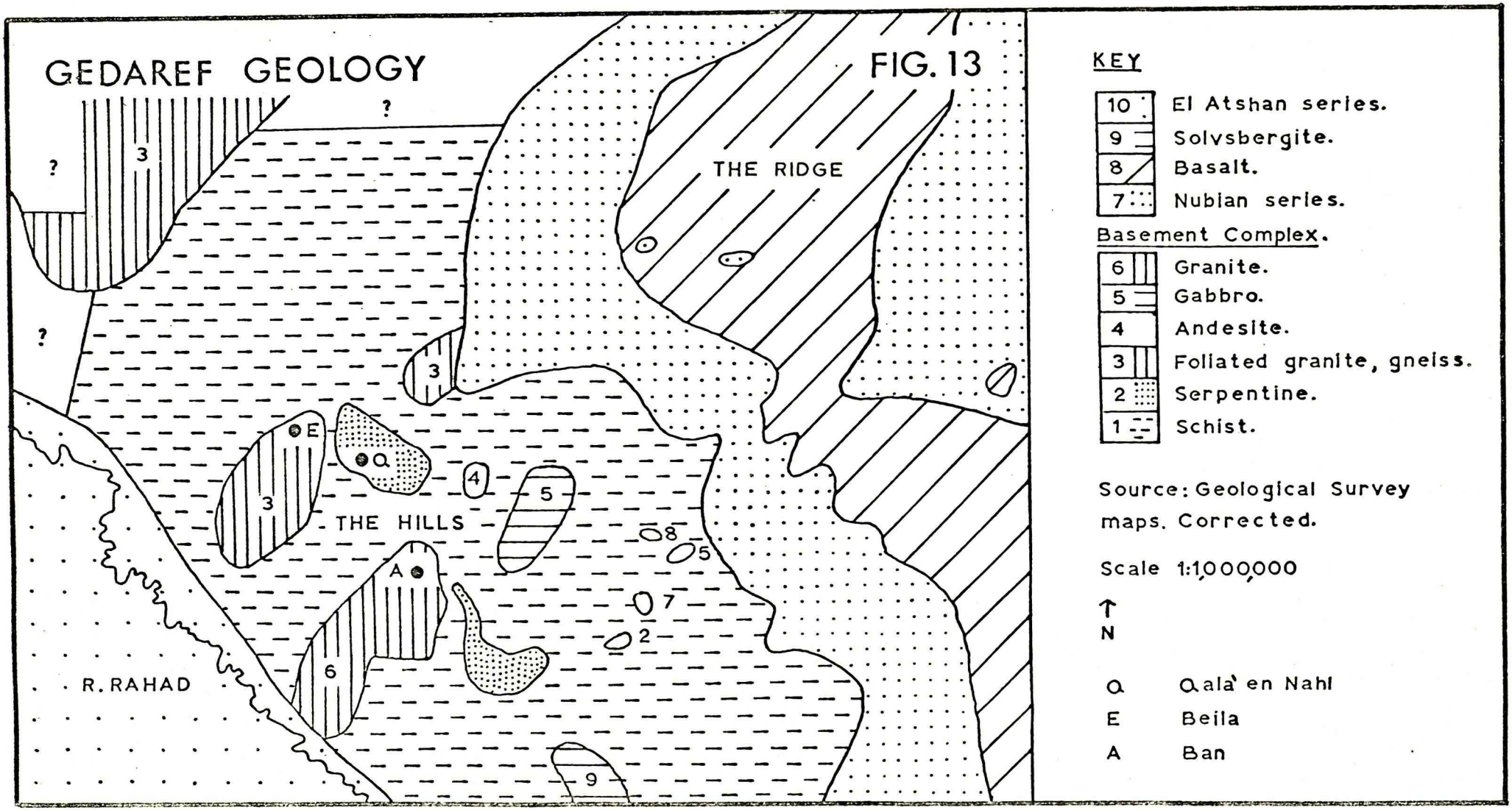
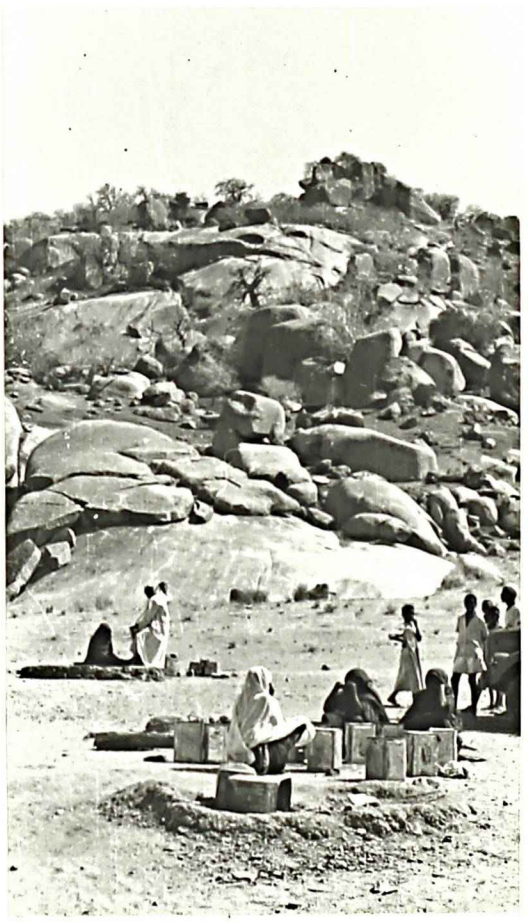
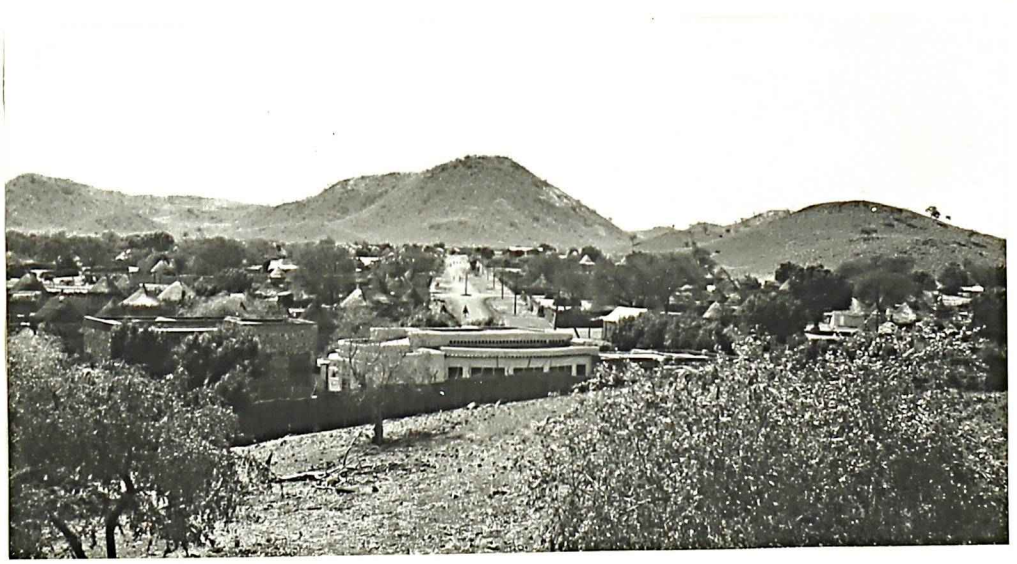

GEDAREF GEOLOGY
FIG. 13
THE RIDGE
THE HILLS
R. RAHAD
?
3
E
Q
4
5
8
5
A
7
2
6
9
KEY
10 El Atshan series.
9 Solvsbergite.
8 Basalt.
7 Nubian series.
Basement Complex.
6 Granite.
5 Gabbro.
4 Andesite.
3 Foliated granite, gneiss.
2 Serpentine.
1 Schist.
Source: Geological Survey maps. Corrected.
Scale 1:1,000,000
N
Q Qala' en Nahl
E Beila
A Ban

FIGURE 14 THE HILL AREAS

(1) The Basement Complex

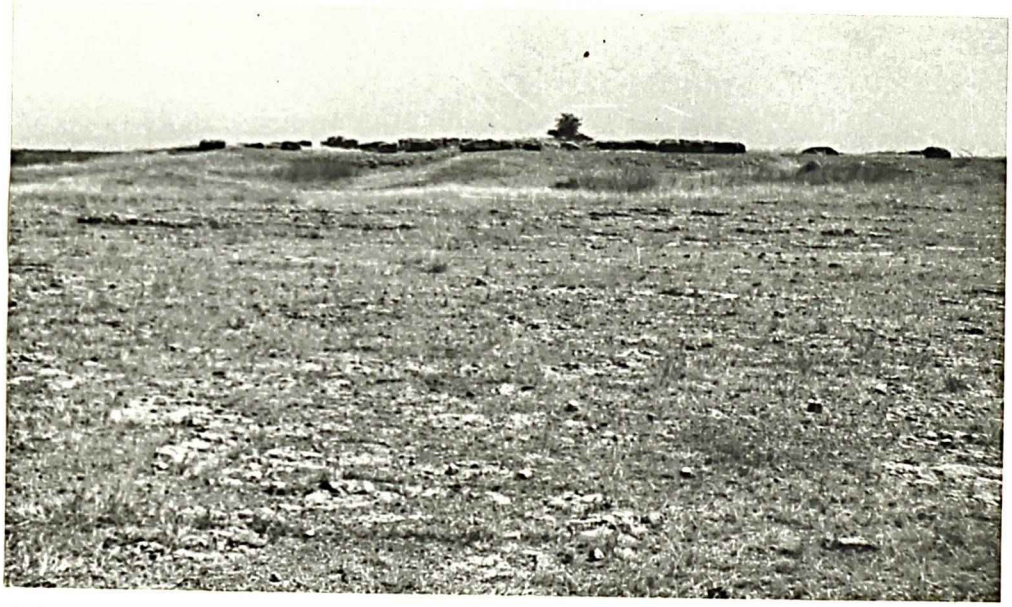


Granite hill with wells in the pediment zone at Ban. (see fig. 53)

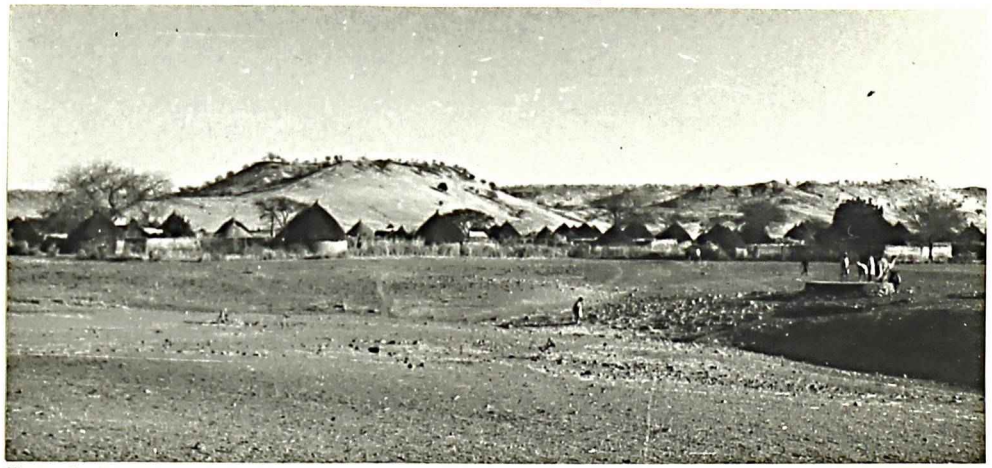


Serpentine range with the town of Qala'en Nahl in a well-watered basin in the hills

FIGURE 14 Cont'd



Nubian sandstone outcropping at ground level and as a low rise near the edge of the ridge at Um Khanjar (The higher outcrop formed the catchment for jamams. These are now filled in but the hollows can be identified by patches of tall grass)



Basalt hills along the crest of the ridge at Assar (The village's main well is in the pediment zone close to a khor)

overlie the basement complex in the eastern third of the area. They are probably of cretaceous or possibly Jurassic age and were laid down unconformably on the eroded surface of the basement. The strata are almost horizontal and the rocks consist of sandstones, siltstones and mudstones. These rocks are known to reach a depth of over 100 metres at one place, but are much less thick elsewhere.

Tertiary basalts. The Nubian sandstone series are partly cut by basaltic sills which were intruded into the sandstone during periods of tertiary volcanic activity and which are closely related to the basalts of Ethiopia. The upper part of the sandstone seems to have been eroded off along the highest parts of the Gedaref ridge, leaving the basalt sill exposed, with fragments of baked sandstone caught up along the zone of contact. Especially near this contact zone, the basalt often contains salt-filled zeolites over 5 mms. in size.

Atshan Series. The Atshan series consist of recent alluvial deposits, sands, sandy gravels and sandy clays. They are depositional features, and are the result of the downwarping of the Rahad-Blue Nile region to form a trough. This trough, which is about 80 metres deep, has been filled in with river-borne deposits from Ethiopia, at a time when the climate was wetter and the rivers larger than they are now. Infilling may, indeed, have

been able to keep pace with downwarping.

WEATHERING AND WELLS.

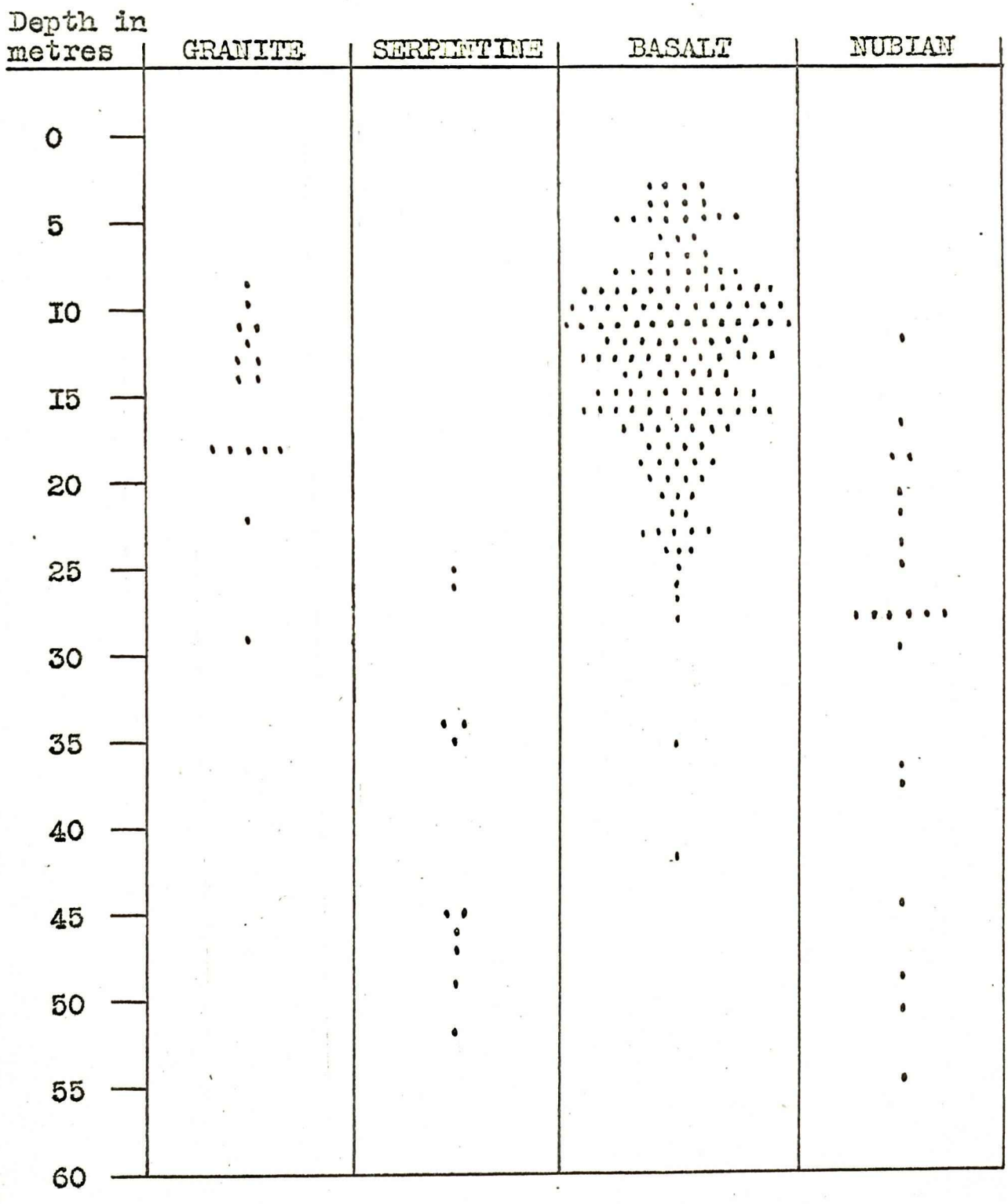
The different ways in which weathering affects the various rock types influences the shape and size of catchment areas, the distribution of wells and the depth at which well-water is found.

(i) Basement complex; (a) serpentine areas. The serpentine rocks form large ranges of hills which rise about 150 metres above the plain. The hills are well-weathered and their slopes are usually covered with rock fragments and weathered debris. As the rock is porous, there is considerable weathering at depth in the hill foot zone where run-off collects. Weathering is greatest where shearing and faulting increase the permeability of the already porous rock. These fault and shear zones also act as foci for streams. Run-off is concentrated along these lines of weakness, providing additional water for percolation. While good water supplies can be obtained from wells sited in the porous hill foot zone, those giving the highest yields are sited in stream beds along lines of shearing and faulting.

Wells in the serpentine are the deepest found in the area. They average 38·9 metres (fig. 15). They are shallowest in the Qala'en Nahl basin, where the high concentration of run-off raises the water table, and makes this area of ample water an excellent

FIGURE I5

VARIATION IN WELL DEPTHS IN AND BETWEEN THE FOUR MAIN ROCK TYPES



. one well

Over 95 per cent of all wells in the area were recorded

site for a town. They are generally deep because of the porous nature of the rock (even when unweathered) which allows the continuous downward movement of percolating water throughout the dry season. The depth of the well indicates the depth of the depressed cone of the water table at the end of the dry season, when percolation has been going on for eight months without recharge and when withdrawals are at their heaviest. Serpentine wells have water throughout the year, so that the proportion of rainfall that percolates into the rock must be very high.

(ii) Basement complex; (b) granite areas. The granitic outcrops form residual hills. They occur in small groups which have been subdivided by weathering along fault and joint lines within the granite. The hills themselves may be dome-shaped with steep smooth faces of fairly fresh rock. Often they are covered with angular or weathered boulders which are derived from break-up along joint planes. Chemical weathering is active wherever water is retained for any length of time. Run-off collects at the hill foot zone where there are considerable depths of weathered material. The micas and felspars of the granite quickly break down to form clay particles, leaving the quartz virtually unaltered. As the finer material is washed away, the quartz grains remain and the weathered rock of the pediment is covered with coarse porous sands

and gravels.[5] Wells are sunk in the pediment zone to utilize the run-off from the hill and the rainfall percolating into the hill foot itself.

Wells in the granite have an average depth of 18·2 metres (see fig. 15). They cannot be deepened to obtain further supplies for this depth represents the depth of the zone of contact between the porous, weathered material and the hard, unweathered and impermeable granites beneath. Run-off from granitic hills is usually dispersed, although occasionally it is concentrated along joint planes. Thus, most hill-foot wells are only tapping water which has run off a small part of the hill's surface, granite hills in any case being small. With this very limited catchment it is not surprising if the yield from these wells is very inadequate.

A jamam is a kind of shallow well. It is an unlined pit several metres deep, dug in the sandy debris very close to the hill, where percolating water seeps slowly through from a joint plane in the rock above (fig. 16).

(iii) Nubian sandstone areas. Nubian sandstone rocks appear to weather rapidly. Over much of their area they are so eroded and low-lying that they are covered with superficial deposits. (The impermeability of the clay renders these drift-covered rocks

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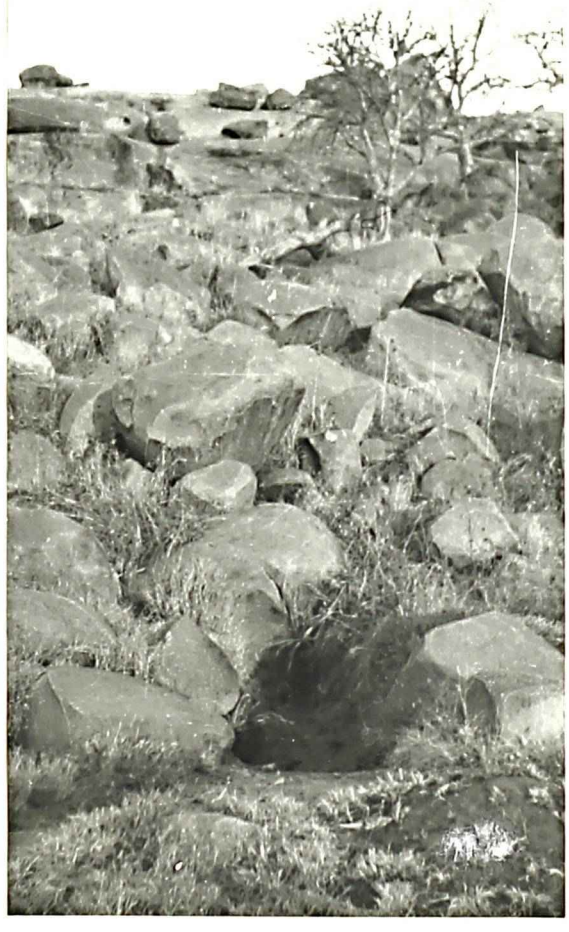
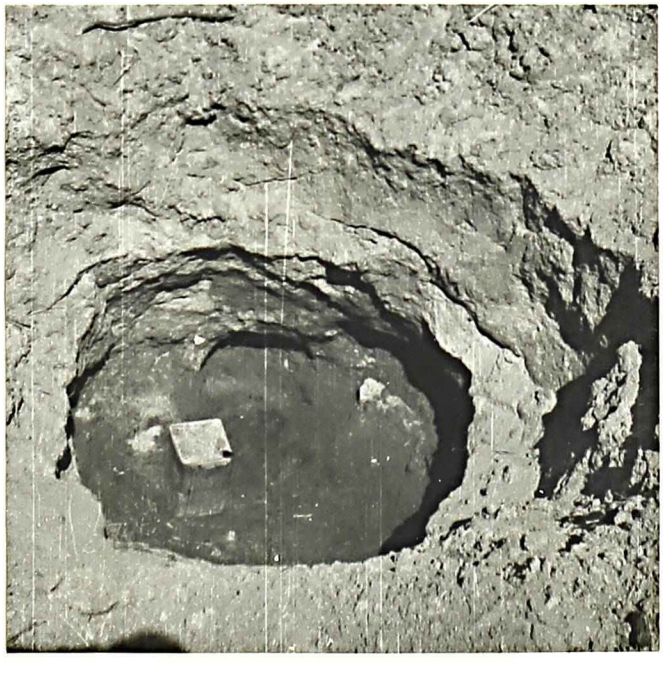
5. Berry & Ruxton, 1958; pp. 353-377.

FIGURE 16 JAMAMS



Jamam in the pediment angle of a granite hill. Kartot



Interior of the Jamam showing crumbly weathered granite debris. (The tin is for collecting water)

useless as sources of water for wells.) Chemical weathering attacks the cementing material of the massive sandstones, reducing them to a debris of resistant quartz grains which form sands and gravels. It enlarges the joints of the mudstones and siltstones, breaking them into angular fragments. Where outcrops occur, the rocks form flat rises or very low hills. The rocks are permeable and where the outcrop is large enough to form an adequate catchment well water is available.

The wells average 31 metres in depth (see fig. 15). They are much shallower in the south, where rainfall is higher and where better developed stream systems concentrate run-off, than in the north. As in serpentine areas, the depth of the well represents the depth of the depressed cone of the water table at the end of the dry season. The Nubian sandstone rocks are mostly less permeable than those of the serpentine, however, for though water supplies last throughout the year, the daily yield of wells was observed to be lower.

(iv) Tertiary basalt areas. Where the basalt outcrops it forms large, flat-topped hills, rising to just over 100 metres above the plain. The fine-grained basalt is impermeable except along its well-developed joint planes. These joints are enlarged by chemical weathering and the rock eventually breaks up. The hills

have scree-slopes (30 - 33 angle of rest) of angular, rather fresh rock fragments. There is some gullying and stream systems from the higher hills are well developed. Weathering is greatest where water accumulates. On the flat ill-drained tops of the hills and lower parts of the rises weathering results in the formation of a dark clay in situ. There is considerable rock disintegration underground along the hill foot zone where run-off collects, particularly where joint planes increase permeability and streams concentrate run-off.

Wells are found in several types of sites. Some are sited near a stream in the pediment area. Others are sited a few miles out into the plain, but where clays are still shallow and mixed with rock fragments, so that they are permeable. The wells are in the beds of big streams, which, because they have large catchment areas in the hills, flow regularly, and carry adequate water for percolation. The bed of the streams consists of weathered material transported from the hills overlying basalt which has weathered in situ. It is therefore permeable. Other wells are sited on the margins of gentle rises.

Because of their different sites basalt wells vary enormously in their depth and adequacy. They average 13·48 metres in depth (see fig. 15). The best and shallowest are near the centre of the

basalt ridge, where run-off from large catchment areas is concentrated in streams. The deepest and most low yielding occur at the margins of mere rises where the size of catchment is inadequate, and where lack of relief results in there being little concentration of run-off. There appears to be some slight seepage along points enlarged by weathering to depths of about 25 metres. Thereafter the unweathered rock is too hard to excavate and anyway is virtually impermeable. An analysis of wells which have failed shows that after about 20 metres the chances of obtaining usable supplies of water are slight.

Potability of water from basalt wells. During the dry season the concentration of dissolved salts increases in all well waters. At this time underground water is not receiving additional supplies of fresh rainwater, and its quantity is being reduced by withdrawals from wells. Meanwhile chemical weathering continues so the proportion of dissolved materials in the water increases. This concentration of salts seldom reaches the potable limits except in wells in the basalt,[6] which itself contains appreciable quantities

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6. In order to find out the potability of water supplies all water analyses in Gedaref Public Health Department were examined and 25 selected new samples were collected and then analysed in the Wellcome Laboratory. The kind of dissolved salts contained in the sample reflected the characteristics of the rocks, over which the water had passed during run-off and percolation. They provided

of salts (see geology section). Particularly in wells where yields are generally low or withdrawals heavy the water may become very salty and its high alkalinity and its nitrate content may be detrimental to health. Samples of water from ten heavily used wells in Gedaref Town were taken in February and April. The maximum potable level for nitrates of 50 ppm. had been exceeded in February and by April the total dissolved salts made the water extremely unpleasant (fig. 17). Yet although detrimental to health, these wells continued in use as there were no adequate alternative sources of supply.

FIGURE 17:

AVERAGE OF 10 SAMPLES OF WELL WATER FROM GEDAREF TOWN.

	February	April
Total dissolved solids in parts per million (p.p.m.) (sample dried at 180° C.)	540	910
Total nitrates in parts per million (p.p.m.)	60	88

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6 (cont.) much detail of the process of chemical weathering. The total quantity of dissolved salts indicated the source of water supply whether bore, well, hafir etc., from which the sample had come. It also gave some idea of the time of year when the sample was collected. But in this thesis only those aspects of the analyses which directly affect the utilization of water supplies are considered.

(v) El Atshan Alluvial Deposits. There are no wells in this series. The deposits are for the most part overlain by impermeable clay. They extend only 2 - 3 miles east of the R. Rahad, which supplies ample water for the people of the area.

THE IMPORTANCE OF THE VARIOUS ROCK TYPES AS SOURCES OF WELL WATER.

Figure 18 shows the importance of the various rock types as sources of well water, and Figure 19 shows the importance of these wells as sources of water supply to the villages of the area.

FIGURE 18:

TOTAL WELLS IN AREA STUDIED FOUND IN MAIN ROCK TYPES.

	Percentages
Basalt	79
Nubian sandstone series	9
Granite (basement complex)	7
Serpentine (basement complex)	5

FIGURE 19:

VILLAGES IN AREA STUDIED USING THE FOLLOWING WATER POINTS AS THEIR MAIN SOURCE OF SUPPLY.

	Percentages
Basalt wells	41
R. Rahad	29
Mechanized hafirs	14
Nubian sandstone wells	5
Deep bores	4
Granite wells	4
Serpentine wells	3

Basalt wells form the main source of water for the people of the Gedaref Ridge, for here clays are often too shallow for hafirs. They support over 40 per cent. of the villages studied as well as most of the people in Gedaref Town, numbering more than 50,000. Those wells with large catchments provide ample water for man and beast all year. But those on the edge of the plain where outcrops are lower and smaller are often low-yielding or salty in the dry season, and the people using them have to fetch water from elsewhere.

Nubian sandstone wells provide water all the year but in the north their yields are generally too low and the effort of hauling too great for them to be used for watering stock. In the south they are shallower and have enough water to cope with large herds. Many wells in the Nubian sandstone are becoming less important as deep bores are developed. Successful bores are high-yielding and obviate the need for drawing water and so are attractive sources of supply. Thus only just over 5 per cent. of all villages in the area relied on Nubian wells as their main source of supply.

Granite wells almost all dry up by the end of January, the only two that last all year having unusually large catchments. (Most continue to yield about 20 - 50 gals every 24 hours for the rest of the dry season.) After the new year, people using these wells either have to turn to supplies from mechanized hafirs (of

which there are many in the area as the surrounding clays are deep), or move elsewhere. Thus granite wells today form the main source of water supply for less than 5 per cent. of all the villages studied.

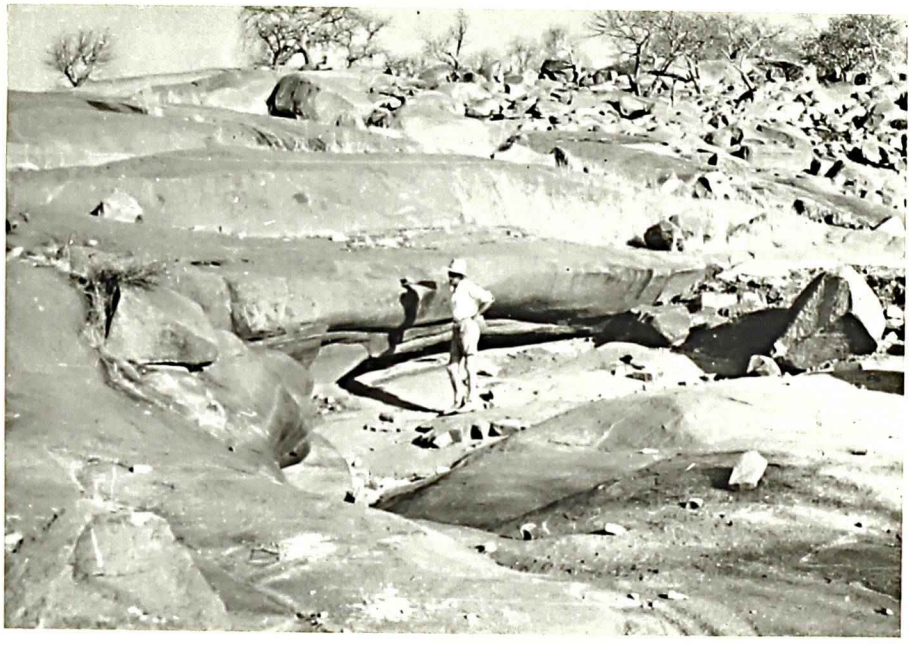
Serpentine wells give ample water all the year but they are deep and hauling from them is arduous. They are thus seldom used for watering stock. In future serpentine areas may come to have a higher proportion of the District's wells, for as pioneer settlements spread south, they will reach the southern serpentine hill mass which is as yet scarcely populated. At present they supply only 3 per cent. of all the villages in the area with water.

GALLITS AS SOURCES OF WATER SUPPLY.

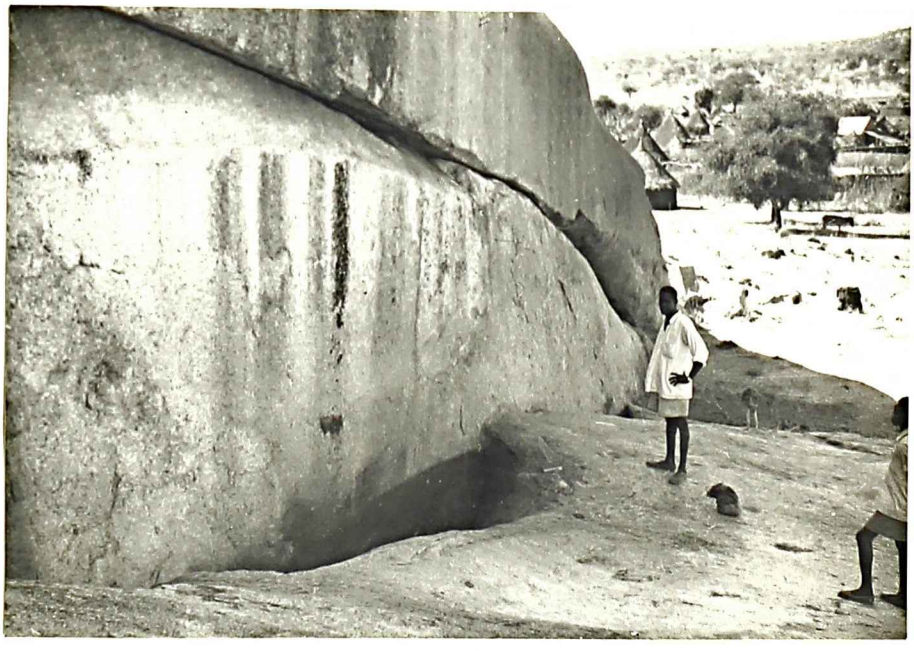
Wells are not the only source of water supply made available by weathering. There are also gallits or rock pools. These are almost all found on the massive impermeable rock faces of granitic outcrops. They are not generally found on basalt or serpentine hills where the surface is broken up and could not conserve water in this way.

The formation of gallits is the result of chemical weathering (fig. 20). They form where run-off is retarded because of some irregularity of the rocks' surface. The water which is retained, combined with the high prevailing temperatures, results in very active chemical weathering. The mica and felspar in the granite

FIGURE 20 GALLITS



Gallit formed from a sheet-joint. Qelbi



Gallit formed from a vertical joint
Buweida

(For triangular gallit see fig.29)

readily break down to clay. During the next rains this fine weathered material is readily flushed out of the small hollow that has begun to form, if it has not already been removed by wind. The process is repeated on the freshly exposed surface and the hollow is gradually enlarged. The deepening continues, but eventually rather more slowly, because removal of material from the hollows becomes more difficult as they become deeper. The less soluble quartz grains in particular tend to collect at the bottom. Moreover the upper margin of the pit tends to become hardened by a coating of dissolved minerals, which are apparently deposited as water is drawn through the rock by capillary action and eventually evaporated.

The most common rock pools are associated with sheet and vertical joints, run-off being held up along the irregularities in the rough edges of the line of the joint. Along sheet joints large oval depressions result. They do not become very deep as the water tends to overflow sideways, and because the sheet joints tend to spread the weathering attack laterally. However, on the Beila group of foliated granite hills hollows of up to 8x4x½ metres are found. Water does not remain long in this shallow type of pool as evaporation is intense. Because the gently sloping banks of the pool make the water accessible, it is reduced by the drinking and

splashing of small animals and birds. Percolation downwards along the sheet joints also gradually reduces the water held. Water rarely lasts more than two weeks after rain, and all pools of this type are empty by mid-November.

Gallits associated with vertical rock structures are deeper and more useful. Weathering occurs around the margin of a joint and a deep canoe-shaped depression results. The sides of the joint above are usually vertical or overhanging. Examples studied range in size from 1 x ½ x ½ metre to 18 x 3 x 3 metres, widths quoted being the maximum. Water may remain in these pools for long periods for there is little evaporation. Even if they are used for drinking, replenishment comes from continued percolation along the joint upslope, at least until the beginning of the dry season. Some water remains until well into January. Some sheltered pools, if unused, may persist throughout the year.

Smaller less significant hollows occur at the intersection of two major vertical joints. These are triangular in shape and quite shallow, probably because the two joints allow fairly ready percolation of water. There are also small shallow weathering hollows found on flattish rock surfaces. In neither of these cases do pools last long after rain and they are little used.

In all cases where gallits are being used by villagers their

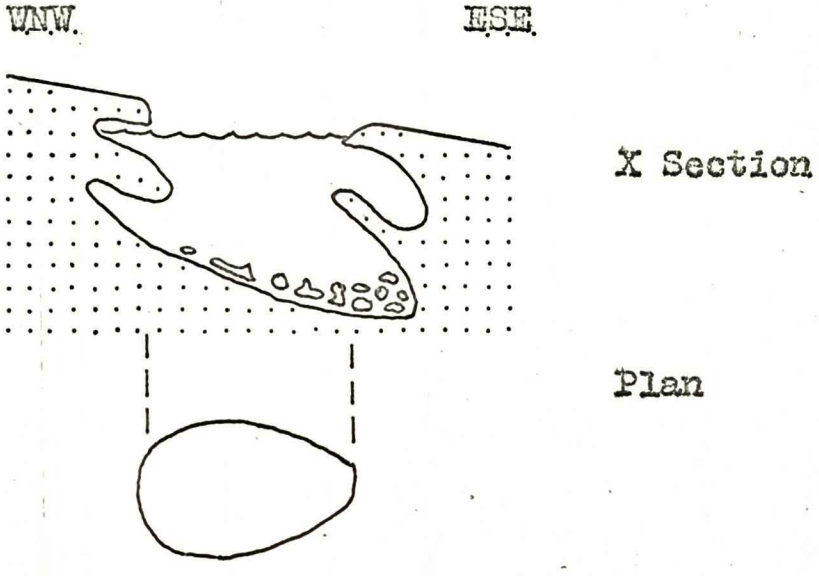
capacity can be increased by cleaning out weathered material, and damming the downslope side of the lip with concrete (fig. 21). Because they are often high on a hill, gallits are not widely used today if other more convenient water supplies are at hand. They are used at the beginning of the rains before wells rise and hafirs fill, and are a most useful source of supply for people preparing their land for cultivation. They do not, however, ever form the main source of village water supply.

"GALLITS" IN NUBIAN SANDSTONE ROCKS.

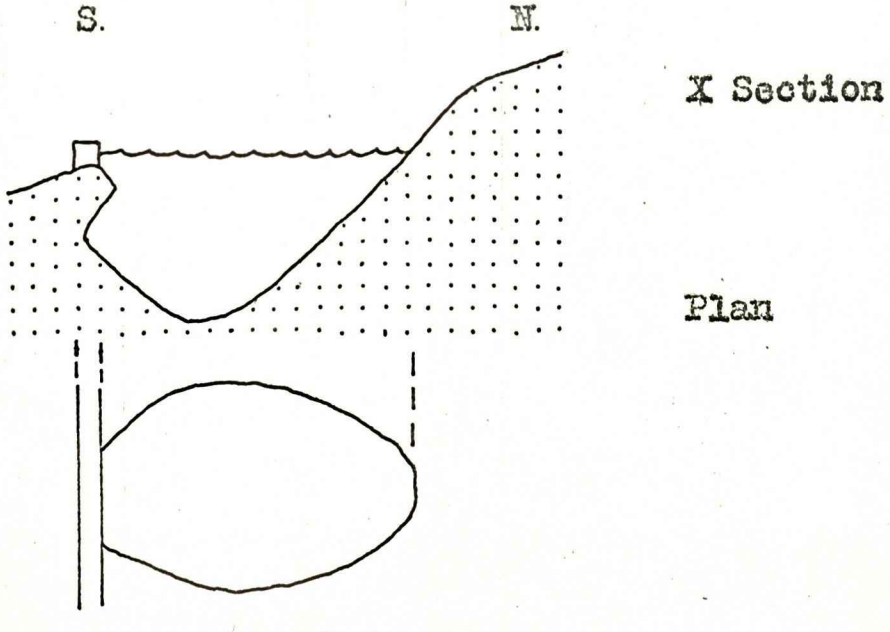
A number of superficially similar rock pools occur in outcrops of certain strata in the Nubian sandstone series (fig. 22). They occur in siltstones and fine mudstones, which are characterized by a close angular joint pattern. The natural surface is often broken up by chemical weathering along the joints into a series of small angular fragments and these appear to have been removed and shallow excavations made into the friable underlying material. The tanks are about 2 - 3 metres deep. At this depth the sandstone is less weathered and therefore both less permeable and harder to excavate than the surface material. The tanks are usually roughly circular in form, often being 10 - 20 metres in diameter. The rocks are almost horizontal, and in areas where good water supplies are available, almost the entire outcrop may have been excavated to

FIGURE 21 PLANS OF GALLITS IN GRANITE.

JEBEL KARTOT.



DAMMED WITH CONCRETE LIP



(Source: From drawings by Ruxton, Geological Survey Dept)

Scale

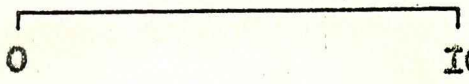
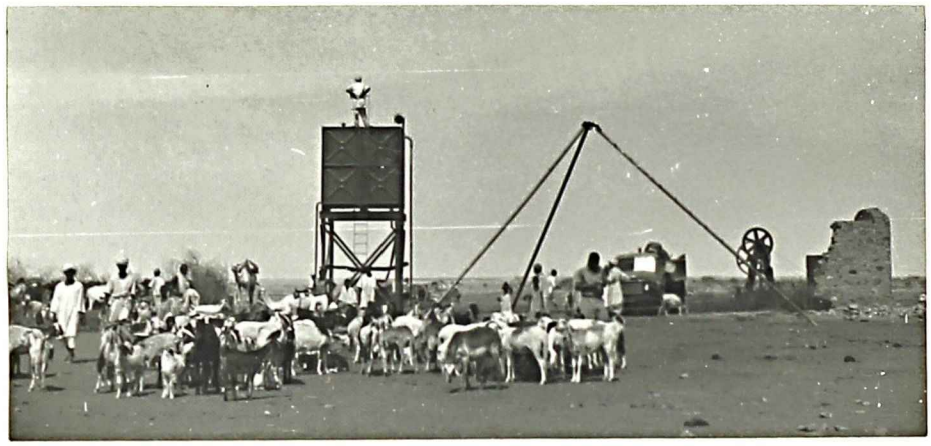
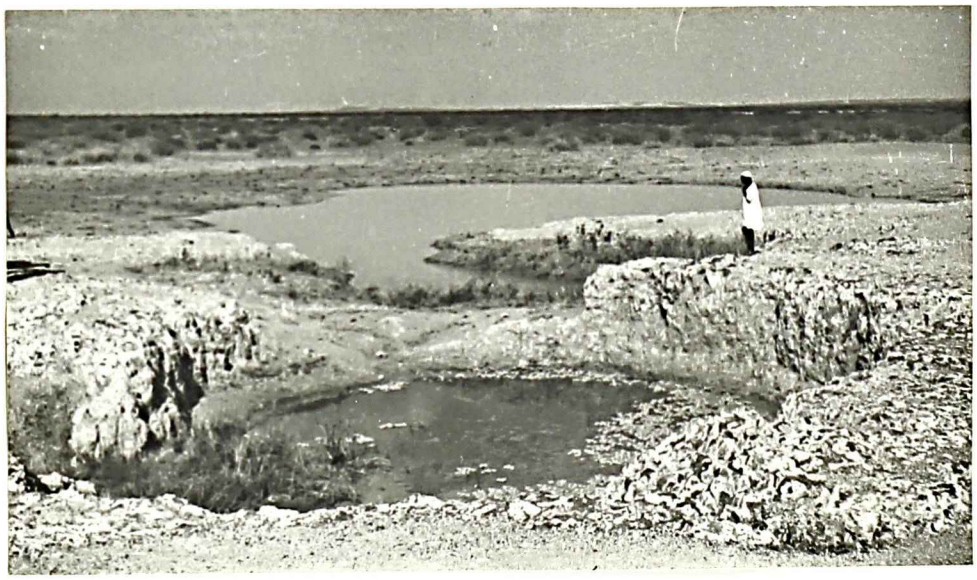


FIGURE 22 WATER SUPPLIES IN NUBIAN SANDSTONE



Deep bore showing animals at troughs, water tank and engine-house. Um Khanjar Donkey



Excavated gallit in fractured Nubian sandstone. Behind is the hafir used to fill the gallit. Um Gulja

form a series of tanks (fig. 23). Thus most of these gallit fields have a negligible surface catchment area and were apparently filled by hand from adjoining hafirs, in much the same way as hollow tebeldi trees are filled in western Sudan.

Gallits of this kind occur in half a dozen or so localities in the area, but they are used in only three places, where they are subsidiary to other sources of water supply. They are gradually falling into disrepair, as the effort of filling them by hand from hafirs is regarded as too great now that alternatives like bores are available.

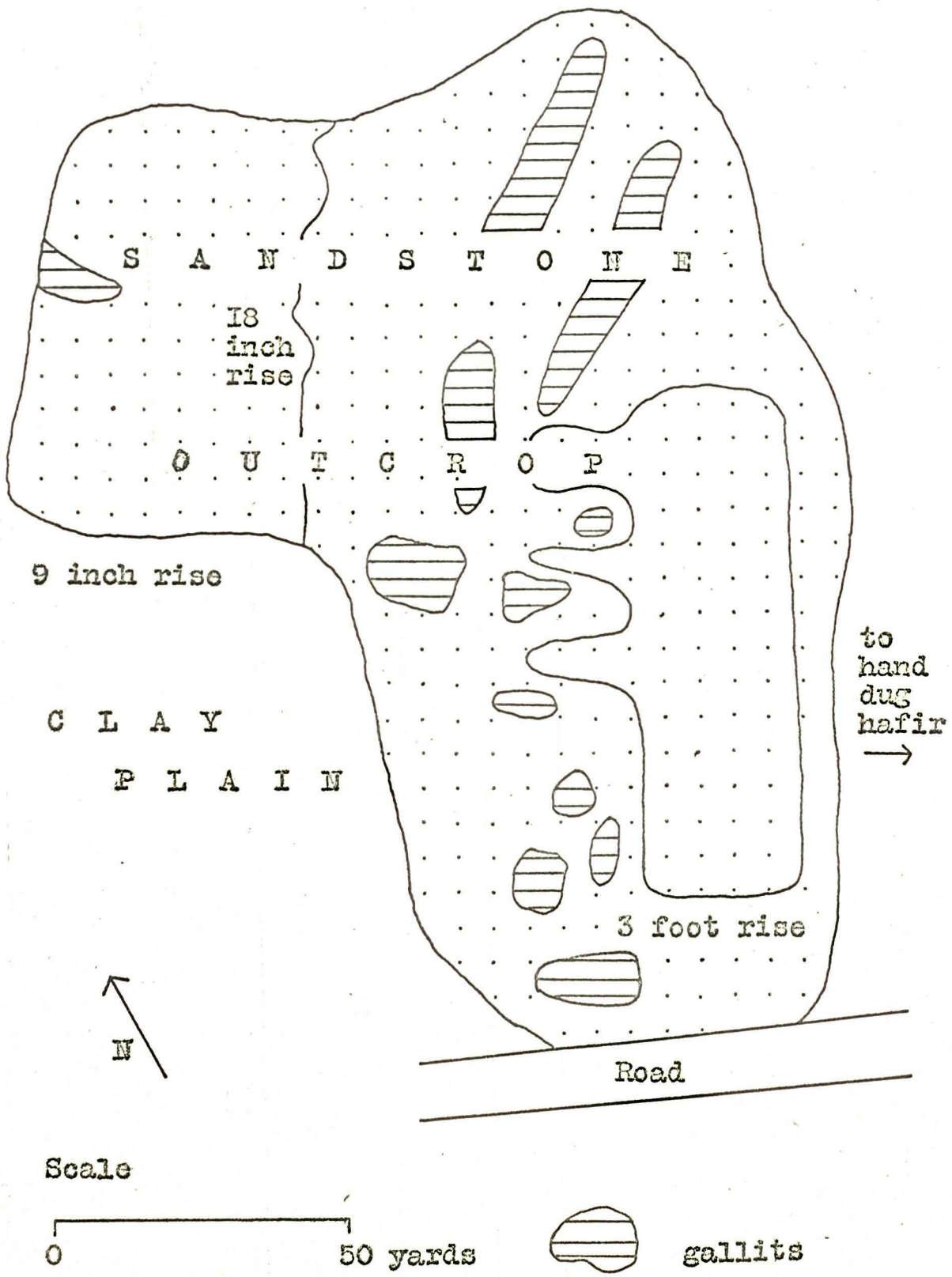
DEEP BORES IN NUBIAN SANDSTONE.

Supplies of underground water at depth are found virtually only in the Nubian sandstone rock series. (One bore has been sunk to tap supplies in the Qala'en Nahl basin, where the serpentine rocks like those of the Nubian are also permeable.)

There are nine deep bores in the area which have been providing drinking water for at least three years. Others initially successful have failed. In some cases this was because withdrawals have exceeded recharge. This has happened particularly in the north where rainfall is low and where basalt, which is permeable only along joints, overlies the Nubian. Withdrawals from a deep bore tend to be much heavier than from other sources of water supply,

FIGURE 23

PLAN OF GALLIT FIELD UM KHANGAR



so that it is perhaps not surprising that recharge is not always adequate. Because they supply water delivered swiftly and effortlessly at the surface, they are particularly suitable for watering stock (see fig. 22). Enormous numbers of nomads' cattle as well as many local animals use the bores in the dry season and contribute to very heavy withdrawals. Compared with their importance for watering animals, the bores are insignificant as sources of supply for humans. Only 4 per cent. of all villages in the area use them as their main source of supply.

Other bores have failed because their water has become undrinkable. In the Nubian sandstone dissolved materials in the water increase with depth. Water from bores of up to 200 metres is generally fit for drinking, but many bores underlying the heavy populated area of the Ridge did not reach water until 230 - 300 metres. Water from these depths usually tastes extremely salty (fig. 24). It is also excessively alkaline, its sodium content rising to over 900 ppm. The water is therefore totally undrinkable. In 1961, a plan to bring piped water to Gedaref Town from a bore over 270 metres deep had to be abandoned after three weeks, because the water from the bore became too alkaline for consumption.

FIGURE 24:

NUBIAN SANDSTONE WATERS.
INCREASE IN TOTAL DISSOLVED SOLIDS WITH DEPTH.*

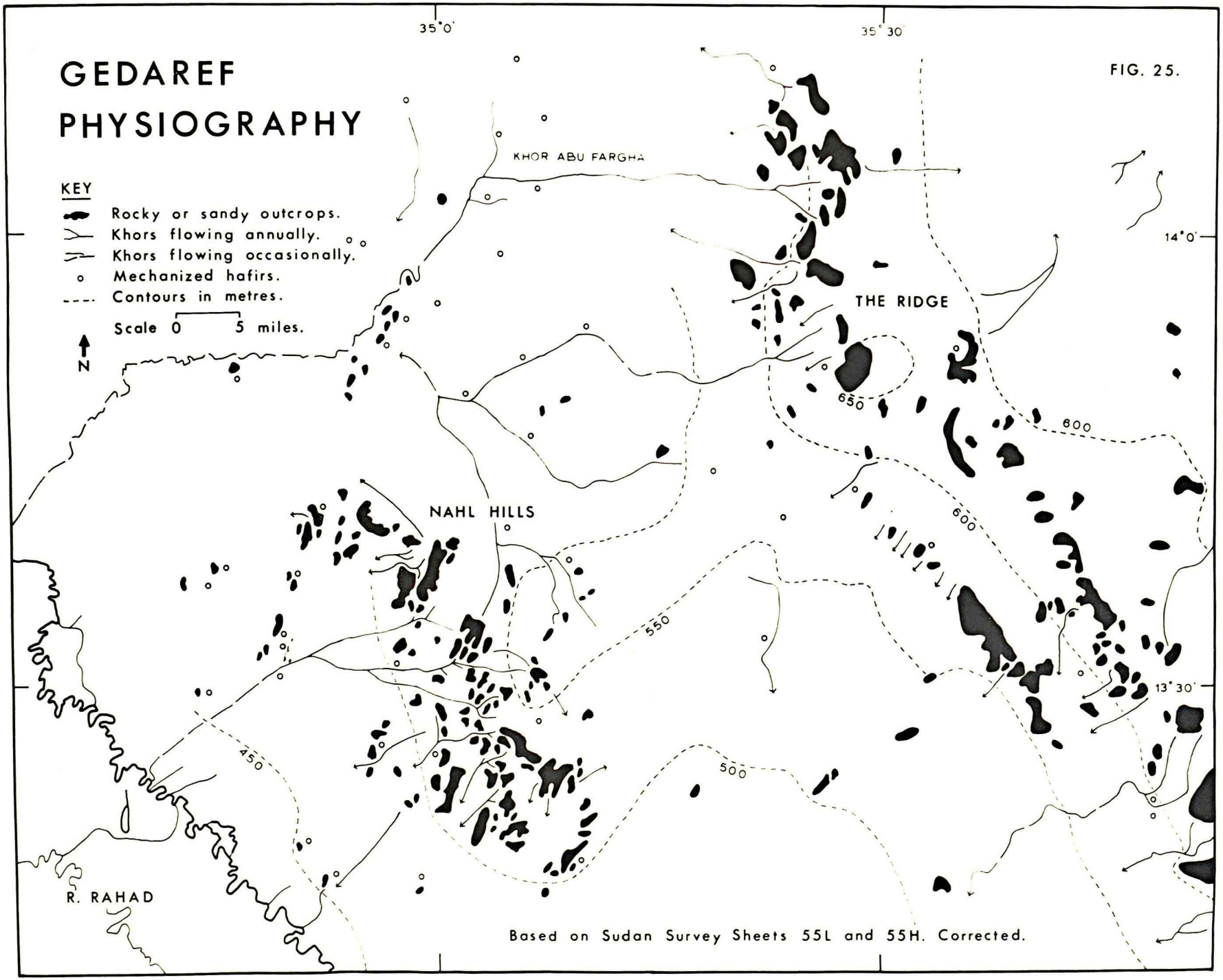
Depth in metres	Parts per Million.
0	250
13	370
70	720
115	680
170	800
300	2,600

* Dissolved solids dried at 180° C.

THE SOIL MANTLE.

Most of the rocks in Gedaref are overlain by superficial deposits of impermeable clay (fig. 25), which forms the most widespread physical feature of the area and enormously influences the distribution of water supplies. These soils show a remarkable physical uniformity. They consist of a dark, alkaline, montmorillitic or "cracking" clay which is called "bardoba". Around the foot of rocky outcrops or where the underlying rock comes within a foot or two of the surface, there are patches of "azaza", a coarse sandy soil which is porous and contains weathered rock fragments.

Somewhat similar clay soils are found over much of east central Sudan, in the Nuba Mountains, in the Gezira, and north of Gedaref in the Butana (see fig. 1). Their origin is obscure. Several


GEDAREF
PHYSIOGRAPHY
FIG. 25.
KEY
Rocky or sandy outcrops.
Khors flowing annually.
Khors flowing occasionally.
Mechanized hafirs.
Contours in metres.
Scale 0 5 miles.
N
35°0'
35°30'
14°0'
13°30'
KHOR ABU FARGHA
THE RIDGE
NAHL HILLS
R. RAHAD
650
600
600
550
500
450
Based on Sudan Survey Sheets 55L and 55H. Corrected.

theories have attempted to account for the origin of the Gezira clays,[7] but these have been considered without reference to the surrounding areas of clay, which have received little attention. Yet since the clays of Sudan are similar in so many ways it seems likely that they have at least a partially similar origin. Worrall, when considering the "high level" clays of Khartoum, was led to a wider consideration of the clays of central Sudan. He wrote that "much of the material may have been derived locally.... Such clay plains ... are common in Africa and elsewhere, especially in the savannah belt, and evidently form under monsoonal conditions."[8]

Observation indicates that much of Gedaref's soil might have been formed by the weathering of local material and that the uniformity of the soil is the result of uniform climatic factors influencing the soil forming processes.

Chemically, both the rocks of the basement complex and the basalt could weather to form a clay of the type found in Gedaref. On top of the flat basalt hills it is possible to see a dark cracking clay forming in situ as a result of chemical weathering of the parent rock. In the granitic rocks Ruxton and Berry[9] showed how eluviated clay is carried out on to the edge of the plinth of retreating hills and spread on to the surrounding plain, leaving

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7. For a summary of these theories see Worrall, 1955; pp. 168 ff.
8. Worrall, 1955; p. 172.
9. Ruxton & Berry, 1958; pp. 353-377.

coarser material encircling the hill. Nubian sandstone with its very high silica content could never weather to form a clay. In Gedaref, however, the areas of Nubian sandstone generally lie downslope from areas of overlying basalt. It therefore seems possible that by a long process of wash and creep on a massive scale soil moves down from the basalt areas over much of the Nubian sandstone. Certainly with its concave slope and average gradient of 15', the clay plain is typical of African erosion surfaces (see fig. 25). The basalt hills are considerably gullied and the depth of the clay here is less than further west, suggesting considerable downslope movement of the mantle. On the edge of Nubian outcrops, the mingling of the sands derived from the Nubian with the dark encircling clay can be seen. Close to outcrops, the surrounding clays in fact contain considerable quantities of sand.

EFFECT OF THE CLAY SOIL ON WATER SUPPLIES.

From the point of view of water supply the most important features of the clays is their impermeability. This impermeability, by prohibiting percolation, renders well digging useless, but enables hafirs, or unlined tanks, to be built to conserve rainwater collected by run-off.

Although the soils show a remarkable physical uniformity there is some decrease in clay content from south to north. An

examination of over forty samples collected by the Soil Science Department of the Wad Medani Research Station showed that the clay content of these soils is normally 70 - 74 per cent. However, individual samples fall as low as 45 per cent. in the north and rise to 81 per cent. in the south of the area. This south-north decrease corresponds to the situation in Gezira. It also fits in well with Worrall's figures for the "high level clays" of Khartoum, which have clay contents of 24 - 48 per cent.[10], if one imagines a gradual continuous decrease in clay occurring as one goes north across Butana. Nowhere, however, is this decrease in clay content sufficient to change the impermeable quality of the soil. Indeed, around Nubian sandstone outcrops, clays contain appreciable quantities of sand and gravel throughout the profile without their physical properties being appreciably altered.

Depth of percolation seems to be more a function of rainfall than of clay content. In this area of low rainfall, the depth to which roots penetrate provides a good indication of the depth to which water supplies for plant growth are available. From observation, the depth of root penetration in the north seems to be about 1½ metres, about 2 metres in the middle and 2½ metres in the south of the area studied. It seems likely that because of the impermeability of the clays water never penetrates deeper into them

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10. Worrall, 1955; Appendix iv.

than this. Thus, wherever more than this depth of clay occurs no underground water is available for wells. Near the crest of the Gedaref ridge clays are often very shallow so that wells can sometimes be sited several miles out into the plain if they are located in stream beds. This same shallowness makes it difficult to site all but the smallest hafirs here, as will be seen later. Generally over the area the mantle has an average thickness of 3 - 4 metres, but it may be only 1 - 2 metres in the higher eastern part compared with over 6 metres deep in most of the lower western part.

DRAINAGE PATTERNS.

Because of the absorptive qualities of its clay soil, its comparatively low rainfall, and absence of marked relief, Gedaref does not have an integrated stream system (see fig. 25). (The R. Rahad, the only reliable annual river, is exotic and receives its water from Ethiopia.)

Even on the basalt hills, where there is considerable gullying, run-off is often unconcentrated and such streams as there are usually stop a short distance from the hills, ending in a wash zone. Only in the basin of Qala'en Nahl and in one or two large streams is there any marked development of tributaries. Khor Abu Quarar in the east and Khor Abu Fargha are the only streams which are

noticeably incised.[11]

During this century water has seldom flowed the length of any of the major streams. After the straightening of Khor Abu Fargha, water was able to flow twenty miles further than normal to fill the hafir at Ghadambaliya, but it has not been known to reach the Rahad in the last sixty years. It seems that the major streams are to some extent fossilized and were formed during a period of greater rainfall.

While the upper courses of most streams will flow for several hours following a storm, the lower courses may flow only after particularly heavy rain, perhaps for a day or a few hours several times each rainy season.

This ill-developed stream system is nome the less immensely important to water supply. Close to the hill in basalt or serpentine areas a stream course may mark an underlying joint or shear zone, and therefore indicate a suitable site for a well. Further out into the plain where clays are deep, stream beds are not suitable well sites as in the sand country of west central Sudan because the clays are impermeable and do not support a perched water table.

Streams are important in concentrating run-off and leading it on to the plain where it can be used to fill hafirs, which have to be

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11. "Khor" means a seasonal stream.

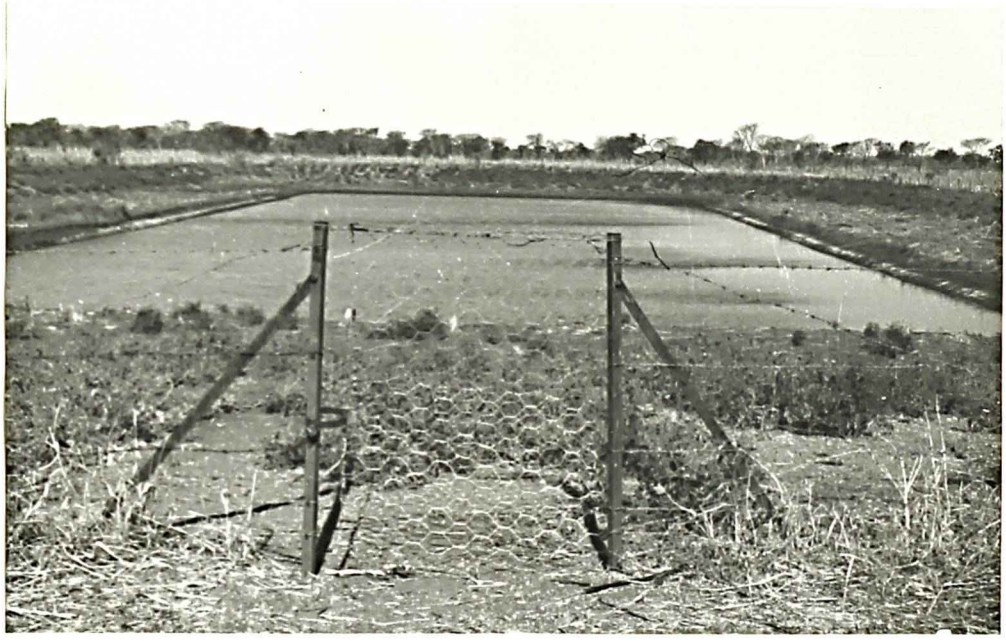
sited some distance from the hill foot to obtain sufficient depth of clay. Near a stream clays are usually deeper than in the surrounding area, probably because the additional water of the stream has enabled greater chemical weathering to take place. Thus hafirs may be sited close to a stream when the rest of the clays in the neighbourhood are too shallow. Occasionally a stream is underlain by (or has near it) a former channel containing lenses of coarse material deposited on the old river bed during time of flood. These sandy lenses would render a hafir permeable and therefore former stream courses are avoided when siting hafirs.

HAFIRS AS SOURCES OF WATER SUPPLY.

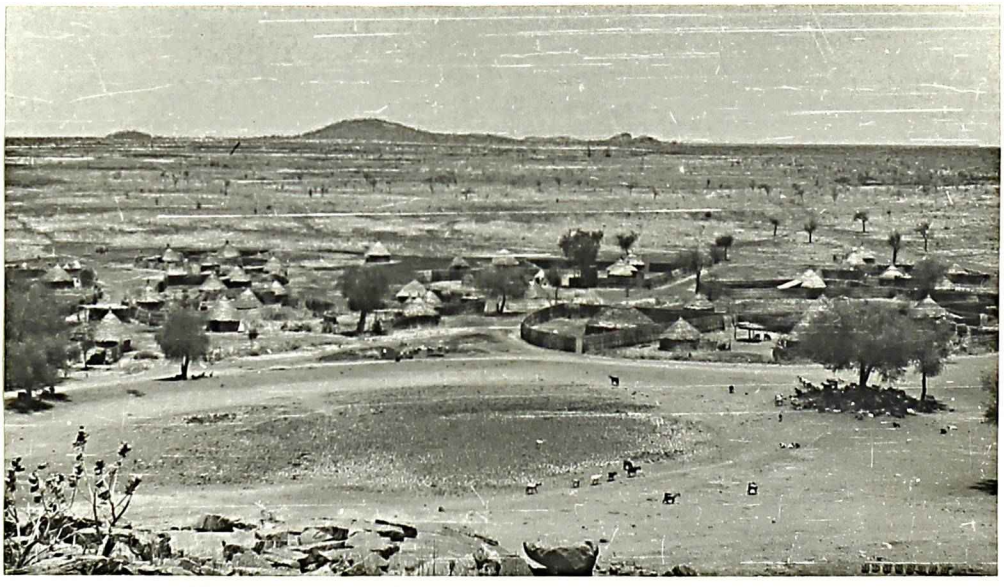
Like wells, hafirs are highly localized (see fig. 25). In order to be watertight they must be sited where there is sufficient depth of clay and where they can be filled either by direct run-off from a hill catchment or by a regularly flowing stream.

About six metres' depth of clay are required for the excavation of a mechanized hafir to be regarded as economic, although many hand-dug hafirs are found in much shallower clays and there are even a few old porous ones sited in "azaza" soils (fig. 26). In order to find clay six or more metres deep it is usually necessary to go about half a mile away from the hill forming the catchment area. Around a granite hill, however, there is usually considerable

FIGURE 26 HAFIRS



A mechanically-excavated hafir in the plain at Aby Hamir (see fig. 94)



A dry hand-dug hafir at Kartot photographed from the hill which provides run-off to fill it. The hafir's banks retain the water and stop the village beyond from being flooded (see figure 47)

chemical weathering at depth and a thick clay mantle can be found quite close to the outcrop. Clays in general are thicker in the west of the district, while those near the crest of the ridge are usually too shallow for the excavation of mechanized hafirs. Moreover in this eastern part of the area around the watershed slopes are rather steep. Canals designed to lead water from the hill catchment into the hafir are liable to erosion, and hafirs are quick to silt up. In the west where the plain is nearly flat these problems are for the most part avoided.

It is generally assumed for working purposes that 3 per cent. of the rainfall over the catchment area can be diverted into a hafir.[12] Where much of the catchment consists of massive impermeable granite the available run-off will be much greater, particularly if it is concentrated along a joint plane. The debris-strewn surfaces of serpentine and basalt hills, however, retard run-off, as does the permeability of the Nubian sandstone. The pediment areas around hills are made of "azaza" and are permeable but nevertheless contribute some run-off, particularly if the sands are cemented with clay, and the plinth area can therefore be said to form part of the catchment of a hill-fed hafir. The higher and larger hills in the area generally form the best catchments. Many of the Nubian

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12. Jefferson, 1952; ii, p.224.

sandstone outcrops lie almost horizontally and almost flush with the ground, and they, together with some of the flatter rises of basalt in the south, are not very useful catchments as they lack slope to concentrate run-off.

Thus it is clear that among the hill areas, both from the point of view of the catchments they provide and in terms of the availability of clay, the basalt and Nubian sandstone areas of the ridge are the least suitable for the construction of hafirs. Luckily they and the serpentine areas have reasonably good well water supplies. In the granite areas those impermeable qualities of the rock which make it a poor supplier of well water fortunately contribute to making it an excellent area for siting hafirs.

Where hafirs are khor-fed the same problems of securing sufficient depth of clay and adequate run-off to fill the hafir arise, but in this case the problem of run-off is most critical. Clays are generally deeper in the plains than around the hills. Clay depths may be adequate for mechanized hafirs even in the east. Besides, as noted before, there are often greater depths of clay beneath khors, and provided sandy lenses are avoided it may be possible to site the hafir close to the stream itself. Usually, however, the hafir is sited a short distance away from the khor and fed by means of an inlet canal, which filters and controls the

intake. Where the khor is large and deeply incised there may be difficulty in getting sufficient head to lead water from the khor to the hafir, as slopes are generally so slight.

The absorptive qualities of clay not only make it generally useless as a source of run-off but actually hinder the establishment of hafirs far out into the plain. During a rainy season an acre of bardoba can absorb 5,000 cubic metres of water or 3·4 cubic metres per square metre of surface area. Khors flowing through the plain receive almost no additional run-off en route, and the water which they are carrying from the hills is reduced by evaporation and by absorption into the surrounding clay. Thus, apart from years of exceptionally heavy storms, small khors may flow only a few miles from their catchments. As hafirs have to be sited where annual flow can be guaranteed, they may have to be located only a few miles out into the clay. A large khor however will usually flow further, particularly if its course is canalized as in the Abu Fargha so that losses in meandering are reduced.

Where the slope of the plain is adequate, attempts were made to construct artificial catchments on the clay by means of digging herringbone trenches to concentrate run-off. The absorptive qualities of the clays are such, however, that there was almost no run-off, certainly not enough to fill a hafir. Hafirs thus

continue to have to rely on hills as catchment areas.

Khor-fed hafirs are just as difficult to site as those fed from hills directly, demanding a considerable knowledge of the khor concerned. Despite siting problems, however, mechanized hafirs form the main source of water for nearly 15 per cent. of the villages in the area (see fig. 19). These are nearly all either in the granite areas of Qala'en Nahl or new villages in the clay plain.

THE RIVER RAHAD.

The River Rahad (fig. 27) has no valley but flows in a flat flood plain. The present flood plain varies in width from a few yards to about half a mile but nowhere extends to the edge of the unfilled geological trough in which the river flows.

The depth of the river from its bed to the top of its banks is about eight to ten metres. The river bed varies in width from about fifty to eighty-five metres. South of Wad Bakr the bed is sandy but thereafter it is clayey with some deposits of kankar gravel.

The river flows for about five or six months each year, its regime being controlled by rainfall in the Ethiopian highlands. During the flood the river often overflows its banks and backs up along small tributary khors. This annual flood creates useful gerf land for growing vegetables.[13]

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13. Gerf is land which is well soaked by flooding, and which, after the flood retreats, contains enough moisture to mature a quick-growing crop without irrigation.

FIGURE 27. THE RIVER RAHAD.

Note pools forming, steep banks and lack of incised valley. On the left, in the distance, is the village of Senegal (see fig. 72) and on the right gerf

Sunt forest in a cut-off meander which is flooded in the rains

The flooding often produces a deposition of silt as a levee along the river banks. This levée, which is raised up, is dry and well-drained in the rainy season and very suitable for settlement, while the ground behind levées is often marshy, being lower and more clayey.

The river meanders tortuously (see fig. 25). There are many cut-off meanders especially in the southern part of the area studied. Many of these fill with flood water in the rains and are later used for fishing. When the floods come, young fish are stranded in these meanders and in tributary khors. Other cut-off meanders are not so extensively flooded and support thick forests of valuable sunt, a moisture-loving tree which is found only in riverain areas.

The banks of the river tend to be steep and are at times almost vertical. It can be difficult, particularly for animals, to reach the river bed to obtain water. These vertical clay banks, moreover, are liable to disintegrate by a process of sheering and rotational sliding. Where banks have slipped in this way but not fallen in they may have low back-tilted terraces two to twenty yards wide very suitable for gerf cultivation. The unstable nature of the banks, however, makes it almost impossible to install water-lifting devices such as saqia (water-wheel) or shaduf (balance pole and bucket).

During the dry season the river ceases to flow and becomes a

series of pools. Their position does not vary greatly from year to year and villages and traditional dry season nomadic camps are established beside them. The R. Rahad, indeed, forms a most important source of water for the area. In addition to the large numbers of nomads and transhumants watering here for part of the year, it supports nearly a third of the settled villages in the area studied.

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CHAPTER III.

HISTORICAL BACKGROUND.

The history of the Sudan, partly because of its very turbulence, partly because of the paucity of written records, and in part because archaeologists have tended to concentrate on the ostensibly richer material to the north, is still a comparatively bare outline. It is still the history of the rise and fall of obscure kingdoms and empires. Local history is a study very much for the future. Thus an attempt to construct the history of a limited area within the Sudan (and Gedaref is an area which has lain outside the main stream of "national" history) must frankly recognize, at least for the present, the impossibility of discovering detail in any way adequate by normal standards.

The aim of this chapter is not to encompass the sum of the human history of Gedaref but rather to attempt some reconstruction of the history of water supplies in the district. In this area man's technical ability to extract and conserve the potential water resources has greatly influenced both ways of life and the location of settlements. The settlement patterns of the past were different from those to today. They reflected different stages in man's attempts to utilize the potentially available water. As man's

skill in obtaining water increased, so new areas were opened up for settlement, grazing and agriculture. Although water supplies have always delimited the areas of possible settlement, the detailed siting of villages has been the result of political and tribal influences. Thus, in following the development of water supplies and in assessing their influence on life and settlement in the past, some account must also be taken of the general history of the area where this is known.

Apart from what can be constructed from archaeological evidence almost nothing is known of Gedaref until about the sixteenth century, although there is a brief reference to what is probably this area in Makrizi's El Khetat, published at the beginning of the fifteenth century.[1] It seems to have lain beyond the sphere of influence of the Meroitic kingdom (circa 725 B.C. - 350 A.D.), for the most southerly Meroitic site recorded lies one hundred and fifty miles north of Gedaref at Qeli, which itself appears to have been only a temporary outpost.[2] Nor is there as yet any evidence that the Christian influences which spread into the Sudan between the seventh and the thirteenth centuries reached Gedaref. The most southerly Christian site recorded is near the junction of the Rahad and the

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1. Burkhardt, 1819; p.499.
2. Hintze, 1959; p.196.

Blue Nile about a hundred and forty miles to the north-west.[3] Lying away from the Niles the Gedaref area probably remained untouched by the influences of the early riverain kingdoms.

It is with the Fung kingdom, which lasted from 1504 to 1820, that Gedaref enters the mainstream of Sudanese history. This kingdom with its capital at Sennar stretched at the height of its power from Darfur to within a few miles of Gondar in the heart of the Ethiopian empire. Weak in the last years, the remains of the Fung empire fell to the soldiers of Mohammed Ali, Viceroy of Egypt, in 1820 and became a vassal of the Turkish Empire. Despite an early uprising in 1822 the Turks retained control of Sudan until 1883 when the uprising (the Mahdia) of the Mahdi threw the country into anarchy. The Mahdi died in 1885 at the height of his power. In 1896 the British Government authorised British troops to advance to Dongola, the beginning of a campaign designed to forestall French advance into the Upper Nile region and which ended with the reconquest of most of the Sudan by 1898. In this year the Anglo-Egyptian condominium was established. It was to continue (with the title of "condominium", never accurate, becoming more and more of a fiction) until 1955 when Sudan gained its independence.

EARLY ARCHAEOLOGICAL EVIDENCE IN GEDAREF.

(i) GALLITS.

The earliest archaeological evidence in Gedaref seems to be

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3. Balfour Paul, 1952; Map 1.

rock drawings. These have been found on three hills of the basement complex at Qala'en Nahl. Rock drawings are common all over the northern Sudan including the Butana, but except for those along the Nile[4] no attempt has been made to date them. They are generally assumed to be the work of neolithic hunters. The Gedaref pictures, the most southerly found so far, show spears, elephants, giraffe, a horse, an unidentified centipede-like creature and palms. Since giraffe and elephant were common in Gedaref until about a hundred years ago their depiction gives no help with dating. (Kirwan[5] assumes that because there are no camels among the drawings they must be older than 2,000 B.C., when the camel was introduced. This is an obvious non-sequitur.) What is important, however, is that in most if not all cases the drawings are closely associated with gallits or rock pools which would have been the source of water most easily available to early man. The hills on which gallits are found form excellent vantage points from which to overlook the surrounding plain. Thus the drawings may easily have been the work of hunters idly awaiting their prey.[6]

More significant and more widespread than these pictures are the hilltop occupation sites. Some are undoubtedly neolithic though others may be much later. The sites are for the most part high on

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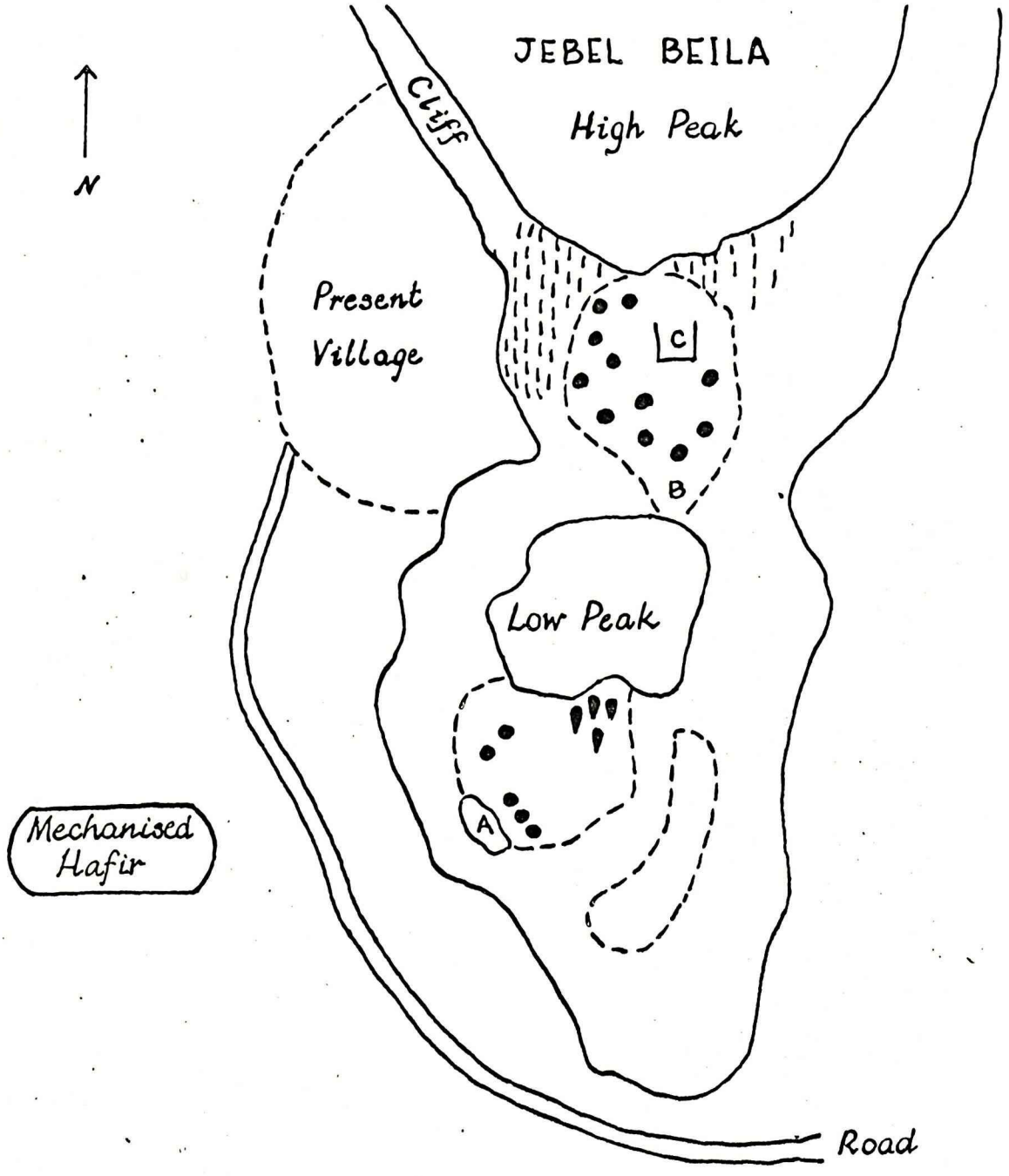
4. Dunbar, 1934.
5. Kirwan, 1938.
6. Dunbar, 1934; p.164.

the crest of the hill or on a shoulder between two peaks (fig. 28). The edge of the site is often terraced, sometimes at several different levels, so that the houses are on flat ground which is not being eroded. The terracing consists of a single width of stone blocks of a size which could easily be lifted by hand. Stone circles mark the sites of individual houses. These have entrance ways and vary from 2·3 metres to 8 metres in diameter. In some of the better preserved ruins there are hearthstones and fragments of a large thick pot which was almost certainly used for holding water. Around the ruins are scattered pieces of pot, querns and fragments of polished stone tools (fig. 29).

Most of the pottery is red in colour, badly weathered and extremely coarse in texture. It was probably made out of local clay formed by the decomposition of granite at the hill foot. At two sites at the base of the hills concerned very thick pieces of pottery which may have formed the walls of a simple kiln were found. On some hill top sites there are Knappflocher close to the gallits. These are small rubbed hollows in the rock, oval in shape, and about four by ten inches in size (see fig. 29). Their origin is obscure but they may have been used for grinding. (Some small grinders which would fit the hollows have been found.) They are, however, all too small to have been used for grinding corn. They

FIG. 28. HILL TOP SETTLEMENT AT BEILA.

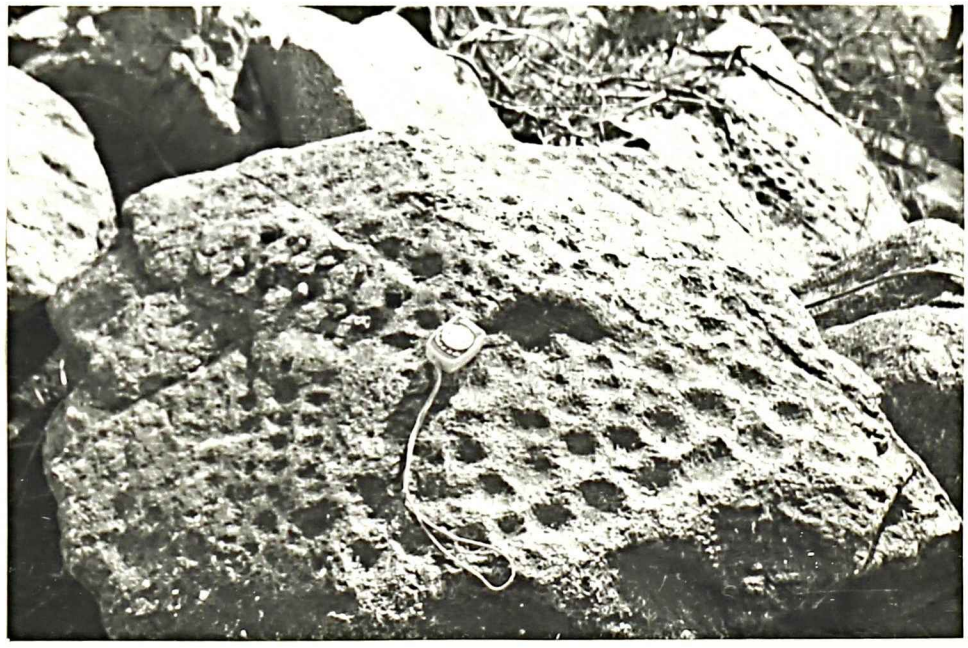


Approximate Scale
1 inch = 100 yards
Source : from a sketch by RAIKES, J. L., in Dept. of Antiquities Files, with personal additions.

- ● hut graves
- graves
- scree
- flat terraced area
- A hand dug hafir
- B many scattered gravestones
- C rectangular area surrounded by stone wall

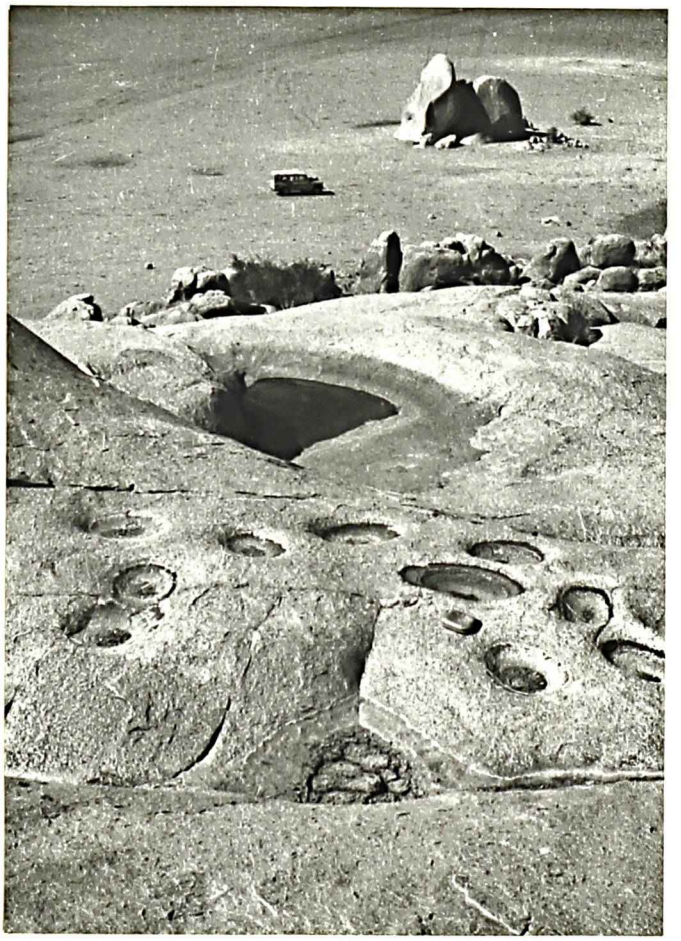
FIGURE 29 ARCHEOLOGICAL EVIDENCE IN GEDAREF GRANITE AREAS

A house circle on the shoulder of Jebel Ban. Note grindstone in the foreground



Rows of hollows in the rock forming gaming-boards near a gallit. El Gir

FIGURE 29 Cont'd.



Knappflocher on a granite hill in the Southern Butana (Triangular gallit in foreground)

may have been used for making oil or grinding the ochre which was used by the neolithic negroes of Sudan for magical purposes.[7] Alternatively they may have been the hollows in which stone implements were polished.

Nearly all the sites are associated with gallits and are consequently to be found only in the area of the basement complex where this type of water supply is found.[8] In two cases pottery was found on hills which lacked these sources of water. In both cases the pots were more weathered than usual, suggesting that they were older, and they are not associated with house sites. The pots may have been used for a magic ritual, or have contained food and water for people who temporarily ascended the hill for security.

The occupation sites suggest that fair-sized villages once existed on these hills. The villagers were cultivators and their fields were probably on the plain since agricultural terraces have been seen only on Sebel Ban. The villagers do not appear to have used wells or hafirs. If their sole supply of water came from gallits the rainy season must have been considerably longer than at present. Arkell suggests that the climate was probably wetter in the past.[9] Certainly during a wetter period these sites would be very suitable for settlement, being well-drained and set above the

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7. Arkell, 1955; p.13.
8. See Appendix D for list of occupation sites.
9. Arkell, 1955; pp.25 - 26.

morass of the clays. In any case, if the dry season was so long that gallits were used up the inhabitants may have gone to the river. Since the Rahad was probably a much larger river than it is now it must have flooded much more in the past. Thus the camps of the migrants would have been far from the present river banks. Since camps are anyway constructed of temporary materials and since the former possible site is now for the most part thick bush, traces of these camps will be difficult to find.

People living in these hilltop villages can have had few beasts. Gallits are not large enough, nor are they convenient for watering beasts, many being too steep-sided. Moreover it would not be easy to get them up the hill to keep them close to the village at night for safety. At the foot of the hill with few people around they would be liable to be preyed upon. Indeed the other great benefit that hilltop sites provided was security for both man and beast. It seems that many of the hills were reoccupied briefly in troubled times, long after settlements had moved down on to the pediment. This probably happened during the Fung period. A Doka tradition has it that while fleeing the Fung left buried treasure on top of Jebel Ukla. On Jebel Kambaros there is fine white pottery, better preserved and so possibly younger than that found elsewhere. Its patterns strongly resemble those on Fung pottery at Jebel Moya.

The chiefs of Beila say that at least at some point the people in the Fung epoch lived on top of the hill, although they also point out a hillfoot village dating from this period.

Water points seem to have been recognized meeting places for early inhabitants. In at least two cases gaming boards are found near gallits. These boards consist of two parallel rows of six hollows in the rock, each hollow being about two inches across (see fig. 29). In the game pebbles are moved from hollow to hollow in various ways. Variations of this game are played right across the savanna zone of Africa. Although the twelve-hole board is the usual one in West Africa today only two Sudanese games, um albanat of the Kababish[10] and andot, which is played by the Beja, require twelve hollows.[11] Yet "fossilized" twelve-hole boards are found throughout the Butana and in Khartoum province, and no ten-hole boards have been found. Gaming boards are not found near rock pictures and there is no way of telling whether they are contemporaneous with the pictures or not. To use a water point as a meeting place for social intercourse is still common among nomads. It is less common among settled peoples who normally have a meeting place within or on the edge of their village. Thus, the users of these gaming boards were possibly dwellers in dispersed settlements of household group size rather as in the Nuba mountains today or

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10. Davies, 1925; p.143.
11. Owen, 1938; pp.201 - 206.

more probably, as games of this sort are still widely played by Arabs today, these boards may be associated with an early use of gallits by Arab immigrants.

HAFIRS.

Archaeological evidence is also of great assistance in determining the history of hafirs. Although we do not know when hafirs were first introduced into Gedaref we can deduce a certain amount about their early use in the Sudan.

The first known hafirs are those found at Masawarat and Nagga, in the north Butana. These are town sites dating from the late Meroitic period. Here hafirs seem to have formed one of the main sources of urban water supply. Indeed, the move from the Nile to the interior of Butana was probably possible only because people had acquired the techniques of digging hafirs. The people of Masawarat and Nagga were agriculturalists and pastoralists, and indeed it seems likely that all the early users of hafirs were more or less settled cultivators. When studying their origins Grabham[12] found that all the early hafirs were sited in areas where rainfall had probably been adequate for cultivation (often a little further north than nowadays) and that large quantities of sherds were found in association with them. Since nomads seldom carry fragile pottery around with them but prefer to carry water in skins it seems likely that at some point in their history, probably before the Arab

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12, Grabham, 1927.

invasions, the hafirs were used by settled peoples for a considerable time, during which broken water pots accumulated round their margins.

The first hafirs all seem to have been horseshoe-shaped and designed to receive the direct run-off from a hill. They probably began when people deepened the pool that formed on the clay margins of a hill after a rain storm. They would soon learn that by enlarging a natural depression into a basin-shaped hollow with high retaining walls on the downstream side, considerable quantities of water could be preserved.

The hafirs at Masawarat and Nagga were in their final form extremely large, and although we do not know their exact size, as excavations are not complete, they are much bigger than hand-dug hafirs today and about five or six times as large as the average mechanized hafir with a capacity of 10,000 cubic metres.

None of the older hafirs in Gedaref show signs of ever having been as large as this. When the technique of digging hafirs spread to Gedaref the less cultured peoples there may have lacked the technical knowledge to dig such large tanks. The need for them in any case probably did not arise. There are no signs of past settlement in Gedaref of anything like the size of the probable urban centres further north.

As with other early hafirs the known older hafirs in Gedaref are sited at the foot of hills. They are often, although by no means always, found associated with broken pottery or other evidence of a nearby occupation site. Thus while some seem only to have been used by people with animals and skin water containers, others either originally or at some later date have been used by people with pottery, who probably lived and cultivated nearby, at least during the rainy season.

Since the early hafirs were sited close to hills they cannot greatly have altered the pattern of settlement and land use established by the use of gallits. Inasmuch as hills lacking gallits might provide suitable sites for hafirs they doubtless enabled a greater use to be made of the hill areas. Many of the older hafirs in Gedaref are in fact sited so close to the foot of hills that they are on the pediment. Their retaining walls are built with a base of large rough stones with sand from the pediment and clay in between (see fig. 26). They must have leaked badly. No early hafirs have been found far out on the clay plains or fed by khors at some distance from hills. They may, however, have existed, for out in the clays their sites would quickly become hidden by vegetation and silting if they fell into disuse. In any case herders probably made some use of rainfall collecting in natural

depressions in the clays and may have enlarged these hollows. However, in the past, when the population was probably smaller than today, there would be less need to extend into the muddy, thickly wooded and inhospitable clays, as enough cultivable land and grazing was probably available at hill foots.

GEDAREF DURING THE FUNG AND TURKIYA.[13]

By the time of the Fung, Arabs, who began to enter the Sudan in the seventh century, had reached Gedaref. They had perhaps either mixed with the former probably negro[14] inhabitants of the region or driven them away. During the Fung the district formed a marchland between the kingdom of Abyssinia and that of Assar. Technically the area round Gedaref Town, which was then called Teawa, was tributary to Sennar while the southern area around Gallabat seems to have ensured peace and quiet survival by paying tribute to both sides.

Periods of peace seem to have been interspersed with international wars, local tribal rivalry and border raiding, all of which hindered settlement and development. The Fung kingdom was tributary to Abyssinia from 1600 until 1611 when the Abyssinians attacked Sennar, penetrating beyond Gedaref on two occasions. This war seems to have been followed by a period of prosperity. A considerable trade developed between Sennar and Abyssinia; slaves,

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13. Crawford, 1951, was used to provide background material for this section.
14. Arkell, 1955; p.24.

hides, coffee, mules, horses and spices were exchanged for Sudanese salt, coral, tobacco and linen goods. The technique of digging wells was now well established and the trade route which passed from Gallabat through Simsim to the Rahad had an adequate supply of water points.[15]

Though it is probably not possible to date the beginning of the well digging there is no doubt that the ability to dig wells had important consequences. Settlement was no longer confined to the area of the basement complex hills. By 1750[16] villages existed in those parts of the basalt ridge and southerly areas of Nubian sandstone where underground water was close to the surface and could be tapped by elementary well-digging techniques. Settlement continued in the granitic areas of the basement but sites were now hill-foot and not hill-top.

Whatever their origins hafirs seem to have been widely used for watering stock during the Fung. Judging from Bruce's account some were now sited away from hills and were very large.[17] For example he describes one[18] as "a large basin or cavity, several hundred yards in length, and about thirty feet deep, made for the reception of water by the Arabs who encamp by its side after the rains." It

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15. Admittedly the route lay well south in a region of fairly heavy rain and most of the wells seem to have consisted merely of holes dug in khor beds to tap seepage after surface pools had dried.

16. & 17. Bruce, 1805; viii, pp.325 - 415.

18. Bruce, 1805; viii, p.335.

was mid-March when he visited this area but the hafir still held water.

It seems likely that it was during this period that the Nubian sandstone gallits were built. They are not associated with pottery and were therefore probably made by nomads, not settled people. Because of their restricted catchment area, most of these gallits require a hafir to fill them and therefore could not have been used before hafir digging techniques had developed. Moreover in view of the skills necessary for their excavation and construction artificial gallits of this kind are unlikely to be very old.

In the seventeenth and early eighteenth centuries the Fung kingdom was at its peak. Pilgrims were encouraged to traverse the area on their way to Mecca. Gradually a colony of these pilgrims, probably Fur, Bagirma and Bornu among them, established itself near Gallabat and secured control of the international trade route. In 1733, however, the Second Abyssinian War devastated the area. The Abyssinians advanced on Sennar and constantly raided Gedaref. Gallabat and the Dubanya emerged as tributary to Ethiopia. It is doubtful if trade ever recovered from this war. Many of the Gallabat people moved elsewhere to look for other forms of livelihood. Abyssinia, too, became weak. Clan warfare broke out in Gedaref. The nomadic Dubanya burnt and plundered the villages of the settled

Jehaina Arabs[19] and at the battle of Um Sugura (named after the vultures which fed on the slain) defeated the Hammada and obtained sole rights to the southern part of the river Rahad. Meanwhile in the north the Shukriya seized the wells of the Ricabin, despite the aid given by the Fung, at the battle of Mandera in 1779, and later achieved supremacy in the Butana by defeating the Batahin (Dabbashat) and Boidre. Although at this period settlement and cultivation were virtually impossible, at least wells and hafirs were preserved for the watering of flocks.[20] The Fung maintained a nominal and tenuous control of the area with small garrisons at Teawa (Gedaref), Beila and occasionally Doka. Their inside flank was protected by the loyal Cuahla Arabs on the northern Rahad.[21] In sum, the Fung had been a period of partial peace and prosperity for the region, a period of increased settlement and improved techniques. But by the closing days of the empire instability had brought confusion and hardship to the area.

In 1820 what remained of the Fung Empire fell to the Egyptian troops of Mohammed Ali. At first the change of suzerainty made little difference to Gedaref. In 1822 the Jaalin led a revolt (motivated by excessive taxation) against the Turks.[22] They then

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19. Bruce, 1805; viii, pp.339, 349, 351, 410.

20. Bruce, 1805; viii, pp.339, 415.

21. Bruce, 1805; viii, p.417.

22. Robinson, 1925, and Cumming, 1937 and 1940, were used to provide background material for this section.

fled across the Butana with the help of their Batahin brothers to the safety of the land beyond the Atbara. There under the protection of Abyssinia they became border raiders. Gedaref was not to remain an unruly marchland for long, however. Part of the Shukriya remained aloof from the Turks but the other part of the tribe became semi-official wardens of the Butana, having gained Turkish favour by helping in a tax foray against the Beja and harrying their traditional enemies the Batahin during the Jaalin retreat. After the revolt, too, they took to themselves much of the land of the decimated Rufa'a. By 1832 the Turks had taken Gallabat, sacking Gondar, which was helping the Jaalin, in 1834. By 1840 their rule extended over Kassala. Turkish governors were established throughout the area and despite the raiding of the Jaalin, which continued sporadically until 1862, Gedaref enjoyed unusual peace.

It was general policy throughout the Turkish Empire to encourage settlement and in Gedaref the Arabs seem to have turned many nomadic camps into villages. The Shukriya made a village near Teawa called Suq Abu Sinn and the Dubanya one at Wad Zaid.[23] (How much this was in response to official policy and how much the consequence of an era of peace it is difficult to say.) The Turkish example of extensive well digging was copied by the Arabs who learnt improved techniques from their conquerors. Some of the

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23. Werne, 1852 (B); p.111.

wells built by the Turkish authorities are still in use and over 35 of the 175 or so wells in operation in the area studied date from this period (fig. 30).

Gedaref district seems to have flourished at this time. According to local tradition, at Assar every home had its well; in Doka there were ninety and the lime trees grew in irrigated gardens. Doka was so large that the butchers killed a hundred beasts daily and settlement between Gedaref and Gallabat was so extensive that there was not a tree to be seen. Along the road there was never silence because of the chatting of farmers at work in their fields. Old men are apt to view their youth through a rosy haze and these tales are doubtless very exaggerated. Nevertheless Lejean in 1865 refers to twenty-four villages around Gallabat;[24] Baker describes extensive cotton, tobacco cultivation and settlement along the Rahad;[25] Werne refers to the many villages around Gedaref, each established at water points one to three miles apart,[26] and Gleichen speaks of how Gedaref's trade was so great as to attract thirty-two Europeans to the town.[27] Heuglin's map,[28] which was later praised by Lejean[29] for

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24. Lejean, 1865; p.128 - 136.
25. Baker, 1867; p.524.
26. Werne, 1852 (B); p.111.
27. Gleichen, 1898; p.324.
28. Heuglin, 1864; Map 1.
29. Lejean, 1865; p.128.

FIGURE 30.

AGE OF HAND-DUG HAFIRS
AT PRESENT IN USE IN AREA STUDIED.

Periods	Percentage of present hafirs built during these periods.	
Pre Mahdia	33	
1901 - 1910	0	
1911 - 1920	0	
1921 - 1930	7	
1931 - 1940	41	
1941 - 1950	5)	plus about 60 mechanized ones after 1945.
1951 - 1960	14)	

AGE OF WELLS
AT PRESENT IN USE IN AREA STUDIED.

Periods	Percentage of present wells built during these periods.
Pre Mahdia	28
1901 - 1910	6
1911 - 1920	6
1921 - 1930	10
1931 - 1940	7
1941 - 1950	15
1951 - 1960	28

its accuracy, shows only the villages along his route but it includes sixteen villages around Gedaref, eight on the route between Gallabat and Gedaref and over twenty around Utash, where settlement along the Rahad seems to have been particularly dense.[30]

Archaeological evidence, too, seems to confirm the existence of numerous settlements before the Mahdia. Although few sites were seen along the Rahad, where vegetation is very thick and would soon cover them, there are many village sites in the two hill areas. These sites are on the bare pediment zone at the foot of hills like present villages. They are marked by numerous pieces of pottery, mostly locally made but sometimes including pieces of the blue and white stoneware which is found widely beside the known sites of Turkish garrisons. There are dura storage pits, graves like those of today and traces of disused and often unfilled wells and jamams. In most cases local opinion agrees that these villages have not been occupied since the Mahdia, and they are not mentioned in condominium maps or government records. Yet the above evidence suggests that they were inhabited fairly recently, probably during the Turkish period.

During the peace of the Turkiya there had been a period of increased settlement and prosperity. Villages were thickly strung out along the basalt and Nubian outcrops of the Gedaref ridge

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30. For a list of European travellers in Gedaref see Appendix E.

where wells tapped the permanent or semi-permanent sub-surface waters. Others clustered at the foot of the granite hills of the basement complex and their inhabitants made annual migrations to the Rahad with their beasts. The Rahad itself was settled with villages of Arab cultivators. Indeed the settlement pattern in the Turkiya was essentially the same as that which slowly reformed in the early years of Anglo-Egyptian rule, although there were probably more nomads in the earlier period.

GEDAREF DURING THE MAHDIA.[31]

During the Mahdia there was considerable fighting in the Gedaref area. Gallabat was attacked by the dervishes in 1883 and again in 1887. Gedaref fell in 1884 and thereafter supported a large Dervish garrison. The southern part of the area experienced almost continual skirmishing between dervish and Abyssinian troops. Even after the fall of Kassala in December, 1897, and the battle of Omdurman the next year, the Dervishes under Mohammed Fadl hung on in Gedaref. Finally at the end of September, 1898, they were forced to flee to Roseires.

It is not easy to estimate the extent of devastation in this area during the Mahdia but according to Gleichen,[32] who is normally reliable, it was considerable. Certainly many village sites have

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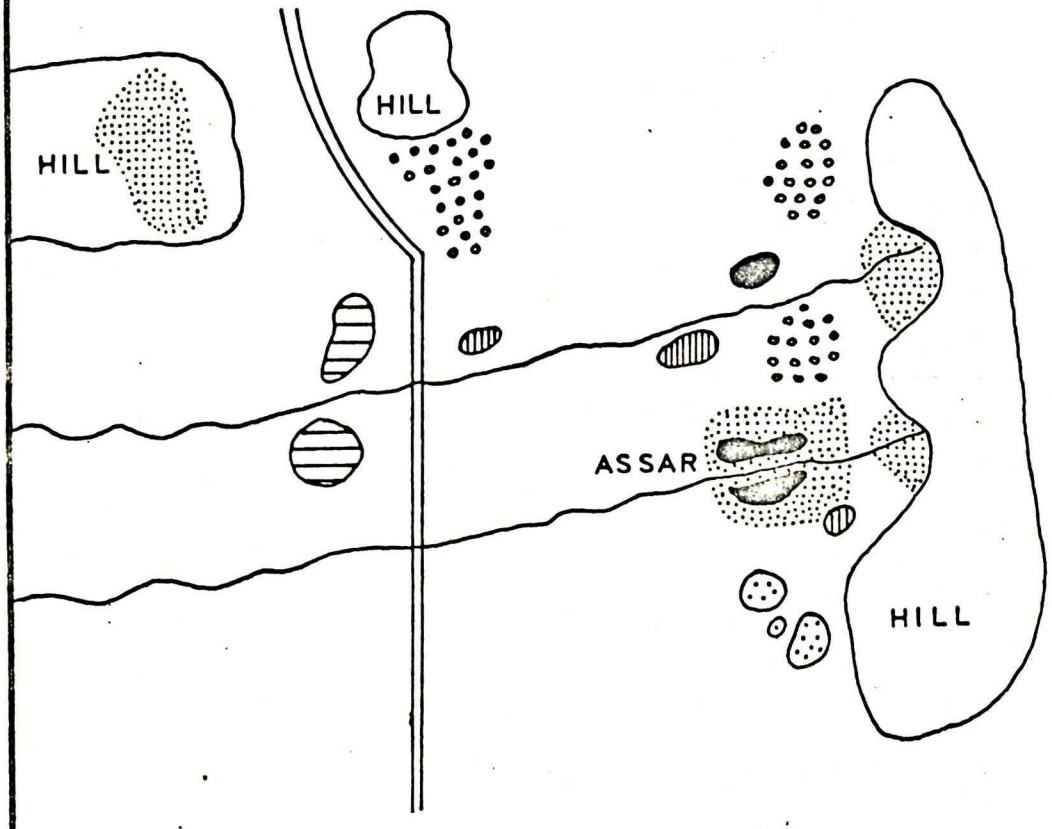
31. Gleichen, 1905, and Cumming, 1937 and 1940, and Newbold, 1924, were used to provide background material for this section.

32. Gleichen, 1905; pp.1, 106.

not been reoccupied since that time and others have been settled not by the original local Arab inhabitants but by people from the west (fig. 31). Even where the site has been reoccupied by the original inhabitants the early village is often still by far the largest. Thus, even after sixty years of natural increase of population at Bea, combined with a general lack of emigration, the village is only a quarter of the size of the pre-Mahdia village. The same is true of Assar (see fig. 31), although it must be admitted that there was a large Turkish garrison here, which increased the size of the old town. What is not clear is how many people from Gedaref area were not killed but merely did not return after the Madhia to the places from which they had fled. If they had filled their wells in before fleeing as many did, to handicap the Mahdist soldiers, they may not have wanted to return to a village without water, especially if the area now contained settlers from the peoples they had been fighting.

Certainly the local Arabs complain of the devastation though they perhaps have every reason to exaggerate. The Sharif of Bea claims that seven out of eight sharifa villages were destroyed during the Mahdia and he can point out their sites. After the Mahdia the Cuahla, who had been settled cultivators in an extensive area along the Rahad since the eighteenth century, and the Dubanya, who with the Shukriya were the most powerful Arab tribes under the Turks, were

FIG. 31. PRE & POST MAHDIA SETTLEMENT NEAR ASSAR.



Re populated pre Mahdia Arab villages

Western Sudanese villages

West African villages

Settled Arab village on site of old nomadic camp

Pre Mahdia village sites

Graves dating from Mahdia

Road

Khor

Scale approx 1inch to a mile

N

considered too few and weak by the condominium government to be allowed to exist as separate administrative units.

Gallabat and its surrounding villages, some of which lay in the area studied, have never recovered from the attacks of the dervishes and the epidemics that followed. Much of the area reverted to forest. Even today as pioneer settlers penetrate the area there are far fewer villages than reported before the Mahdia. The road from Gedaref to Gallabat and from Gallabat to Sennar, major routes until fighting stopped trade, were virtually impassable through disuse by 1902.[33] Abyssinian trade has never again assumed large proportions. As a market Gondar seems to have declined and the bulk of the Ethiopian trade is now carried on through Kassala and Eritrea.

POST MAHDIA PERIOD.

When peace came the remnants of the tribes crept back and reoccupied some of their former villages (fig. 32). But the Dubanya and Cuahla, who as early as 1750 had been closely settled along the Rahad in the Mafaza area, were never to regain their political status, for although the British administration gave khuts[34] to both of theme tribes they were so weak that they proved to be non-viable political units.

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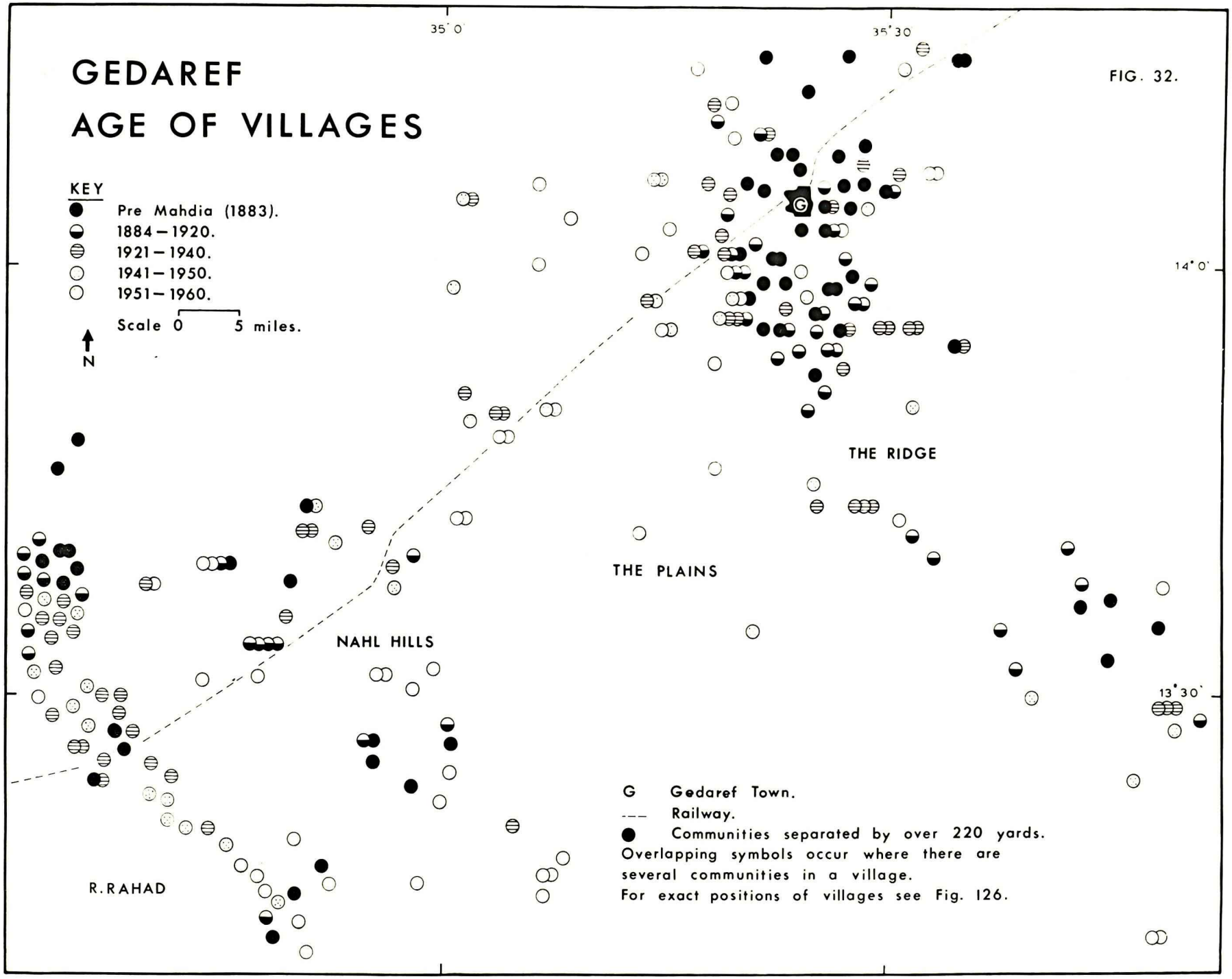
33. Sudan government, 1902; p.296 & 1905; p.88.

34. In Gedaref a khut was the largest sub-division within a district before the formation of rural councils.


GEDAREF
AGE OF VILLAGES
FIG. 32.
KEY
Pre Mahdia (1883).
1884 – 1920.
1921 – 1940.
1941 – 1950.
1951 – 1960.
Scale 0 5 miles.
N
35° 0'
35° 30'
14° 0'
13° 30'
THE RIDGE
THE PLAINS
NAHL HILLS
R. RAHAD
G Gedaref Town.
--- Railway.
Communities separated by over 220 yards.
Overlapping symbols occur where there are several communities in a village.
For exact positions of villages see Fig. 126.

There were other groups in the area besides the local Arab remnants. After 1884 Gedaref was a strong Dervish stronghold, shown by the fact that the soldiers of the Mahdi and his successor the Khalifa had rested and even cultivated there. They had even established wells in intervals between campaigns.[35] After the battle of Omdurman the Dervish garrison at Gedaref was joined by fugitives. Thus when peace came there were large numbers of Western Sudanese soldiers, no doubt with their camp followers, in the area. Seeing the large areas of empty, cultivable land many decided to settle. Relatives of the Khalifa moved to settle in seclusion and semi-retirement at Ban and attracted to them a pious entourage. For the most part these Western Sudanese re-occupied old Arab village sites, where they knew there were water supplies, even if the actual water points had fallen into disuse or had been filled in by refugees as they fled. By 1900 many Western Sudanese were farming in the area and with the good harvests in the following years they increased in prosperity.[36] Eight years later they had begun to acquire stock and showed all the signs of becoming permanently settled in the district.[37]

For the British administration the situation was confusing.

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35. Government files, Administrative Offices, Gedaref District.
36. Sudan government, 1902; p.295.
37. Sudan government, 1908; p.543.

Returned refugee and soldier settlers were inextricably mingled territorially. The Sudanese looked for leadership to the old dervish officer class, the Arabs looked to their traditional tribal rulers, now largely shorn of their feudal authority and wealth. In the words of Bailey, the District Officer:[38] "There was rivalry between the new chiefs, who had turned 'friendly' to retain what they had won, and the old who expected to be given back all that they had lost. All this produced in the interim a chaotic medley of enclaves without boundaries in which, for instance, different parts of the same village might be under different sheikhs and nazirs."[39]

Politically, the British divided the area among the Arabs and the Western Sudanese.[40] Three traditional Arab chiefs, the Shukriya as well as the Dubanya and Cuahla, were given khuts. One of Ahmed Fadl's

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38. Government files, Administrative Offices, Gedaref District, 1924.

39. A nazir is the head of a tribe, or, in the case of Gedaref, the head of a group of tribes. Beneath him in the traditional hierarchy of authority are omdas and then sheikhs.

40. Hereafter, members of the Arab tribes which were in Gedaref District before the Mahdia are referred to simply as 'Arabs'. Immigrants entering Gedaref District from Western Sudan after the Mahdia are called 'Western Sudanese'. They include members of both negro and arab tribes. Many of the tribes with arab genealogies have negroid characteristics. Foreigners from countries lying to the west of Sudan are all referred to generally as 'West Africans'. For a complete list of tribes found in the area studied see Appendix D.

officers was put in charge of Gallabat, which had been peopled by Western Sudanese pilgrims, and another, Abu Bakr, was given the land to the south and west of Gedaref. Later the Western Sudanese west of Gedaref split off under Musa Yagoub of Qala'en Nahl, Gallabat came under Abu Bakr, who was related by marriage to the Gallabat ruler, and the Cuahla and Dubanya khuts were absorbed by the Shukriya and Abu Bakr respectively. (Today, a descendent of Abu Bakr is nazir of Gedaref South Rural Council, while Musa Yagoub's son administers Qala'en Nahl Rural Council. Gedaref North Rural Council is in the charge of the Shukriya nazir, who is a member of the ruling family of Abu Sinn.) The establishment of these territorial units meant that some redistribution of population took place, people naturally preferring to live under the wing of a member of their own race.

Savanna Africa now lay under the enforced peace of colonial powers. The pilgrimage, never completely broken off in the Mahdia, increased again. The Takruri already in the area were joined by other pilgrims from as far west as Senegal and Gambia. By 1912 there were over six hundred at Gedaref and small colonies of them at Mafaza and Gallabat.[41] They usually stayed a year or so in Gedaref District before proceeding to Mecca and had already won a reputation for hard work, working as independent farmers and hired urban labourers and their womenfolk at domestic tasks, as they do today. When the railway between Sennar and Port Sudan was built,

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41. Sudan government, 1912; pp.97 - 98.

linking Gedaref and the outside world in 1926, even more pilgrims were channelled through Gedaref. Given the availability of land and lack of hostility to immigrants it was easy for the newcomers to halt at Gedaref until they had accumulated enough capital for their onward journey. As settlers arrived so Gedaref was once more opened up. Land which had reverted to forest was cleared and put under cultivation. Dura was still the staple crop but dukhn (Pennisetum typhoideum Stapf. and Hubbard) was introduced by the Western Sudanese and West Africans, who were accustomed to grow it in the sandy soils of their homeland. Simsim acquired a new importance as the main cash crop. (Cotton, in the face of Gezira competition, became insignificant, and tobacco production was not reintroduced.)

Flocks and herds were once more accumulated. Since this process requires time many once nomadic Arabs were forced to settle and obtain a livelihood from cultivation while restocking. Where water supplies proved adequate for permanent settlement, many did not become nomads again.

The population though racially now very mixed settled in the traditional areas where water supplies were available. Villages were strung out along the river Rahad or clustered at the foot of the hill masses. The north of the area with its more easily cleared

land was reopened first. Hunting continued in the forests between the hill masses and in the lands to the south, despite the administration's attempts to establish stringent game laws. As population expanded settlers moved south, but even today the southern part of the area is largely bush which was once probably under prosperous agriculture.

MODERN HISTORY.

During the Mahdia many wells were deliberately filled in by villagers fleeing ahead of the soldiers. Other wells and many hafirs fell into disuse and silted up. After the Mahdia, though many of the wells remained useless, a few of them were cleaned out and at least thirty pre-Mahdia hafirs were put back into use (see fig. 30). The remnant population of the district was so reduced that it did not need more water. Indeed for some years after the Mahdia the human and animal population was so small that scant water supplies often served a village throughout the year. As the population began to increase water supplies again became inadequate and traditional migration and transhumant patterns were resumed. During the years following the Mahdia the population was not only expanding naturally but immigration steadily continued. Young men left the western Sudan to join relatives in Gedaref, especially after the annexation of Darfur in 1916. With the coming of the railway in

1926 even more pilgrims were channelled into the area. Both these migrations continue to this day.

In answer to the increasing pressure of immigration the condominium administration early showed an interest in developing water supplies,[42] and the officials used modern techniques to sink wells in the serpentine areas of the basement complex. It seems that the water table in these rocks had previously been too deep for hand excavation methods for there were no pre-Mahdia wells there. This meant that a whole new water environment was opened up for settlement and, as water supplies in the serpentine were good, large settlements like the administrative town of Qala'en Nahl were made possible (see fig. 32).

The coming of the railway made alterations in the pattern of settlement other than those mentioned above. Since Sudan Railways were prepared (under duress) to provide water in the dry season, settlements were established along the line (see fig. 32). As the line often ran through virgin country the settlers, for the most part Western Sudanese, had excellent opportunities for agriculture and extractive forest industries, as well as a chance to trade, exporting the goods of the area and importing consumer goods from outside by means of the railway.

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42. E.g. Sudan government, 1904; p.68 & 1906; p.633.

Between 1930 and 1940 the government initiated the construction of over forty hafirs in the district (see fig. 30). The instigator of most of this work was a district officer, Major Evans, whose energy and eccentricities have become legendary. More than any other one man he influenced the development of the district. Over thirty hafirs and numerous wells bear his name. Major Evans personally supervised the building of most of the hafirs during the dry seasons of 1931 - 1935, the labour being provided first by teams of Ethiopian bulls, and later by local forced labour.

These government hafirs relieved some of the pressure on existing water points and, for a while at least, reduced the inconvenience of transhumance and migration. Although they were shallow and suffered so much from evaporation that they were dry by January or February they saved the wells from being overdrawn early in the season. They enabled herds to be watered effortlessly during the cultivation season (watering from wells is a much greater labour). Often they enabled beasts to continue to provide milk for the village until after the harvest, when both man and animals could move to the river together. Thus the hafirs helped to alleviate the water problem in areas of traditional settlement. The improvement was purely temporary - the population continued to increase and consumed the extra water. The new hafirs began to silt up and were

inadequately managed. During the war, with fighting south of Kassala, the government was preoccupied with other matters.

Although these hafirs built in the 1930's were fed from hills not from khors, some were sited on isolated hills on the edge of the main groups so that new areas of plain were made accessible. New regions of harig[43] were opened up and bildat[43] extended into the clay lands - and this at a time when areas close to the hills were beginning to become overcultivated and crowded. By establishing hafirs which held enough water for occasional gatherers until about February some of the more remote areas of forest could now be exploited for gum. But these efforts to penetrate the clay plain were but nibbles around the edges.

Most of the clay plains remained forested, providing game, timber for building, charcoal and gum arabic as they had always done, until after the Second World War. During the war timber cutting accelerated. The general food shortage in the Middle East prompted experiments in growing dura under conditions of mechanization. It

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43. Harig land is open grassland which lies at some distance from villages. It is cultivated every few years. After the rains have generated new weed growth the entire grass cover is burnt off and cultivation commences on the ash-enriched soil, which is now free from weeds. After harvest, the area is left to revert to grass, and two or three years later when a sufficient matt of dead grasses has accumulated it is reburnt.

Bildat land is the land which immediately surrounds settlements. It is usually under permanent cultivation, as fallow is seldom practised.

was found, however, that it was impossible to harvest the crop without manual labour, and that labour needed water. In 1945, using information derived from pre-war experiments, it was found possible to use machinery to dig large hafirs in the clay, the first one being Lake Smith in the north-west of the area. These hafirs required a considerable depth of clay and were therefore usually sited in the west overlying areas of basement rock. Near the watershed area in the east clays were too shallow but here, in some places, it was found possible to sink deep bores, five to eight hundred feet deep, to tap underground water in the Nubian sandstone rocks. It now appeared that the whole area of the clay plains could be developed. In 1945, 12,000 feddans of previously used clay plain north of the railway had been put under mechanical crop production.

Since 1945 more than sixty hafirs have been built in the area, mainly in the years 1949 - 1950, 1954 - 1955, 1957 - 1958 and 1959 - 1960. New areas have been put under mechanical crop production so that the present area is nearly a million feddans. The entire land use pattern was revolutionised as the northern bush lands with their hashab timber and harig fell under the tractor (see fig. 4). Much of the thicker southern forest remains, however, and while cultivation may now have penetrated up to the heart of the plains, the settlement

pattern does not show a similar dispersal. The bores and the earlier mechanized hafirs built in the clays were designed to provide water throughout the year and to attract permanent colonists who came fairly readily. Later, however, water from several bores became too salty for use and it was increasingly doubtful whether any but the best hafirs would fill regularly and sufficiently to support a village. Moreover, when the mechanical crop production scheme became a business enterprise there was no longer land for peasant colonists within its boundaries. The demands of this kind of agriculture were too seasonal to supply adequate employment for landless villagers. Thus, of the 230 or so villages in the area less than 35 are clay plain villages established during the last fifteen years (see fig. 32).

Much help was given in alleviating the water situation in the traditional areas of settlement. Over fifteen hafirs and several deep bores were built on the sites of existing villages. Like the hafirs of the 'thirties, they alleviated the need for transhumance. About the same number of hafirs and bores were built to enable greater use to be made of traditional gum, grazing and harig areas of the plains, by providing water that would last at least nine months.

Thus, while the new techniques of digging hafirs and sinking bores mechanically have completely altered the entire land use of the

area, the pattern of settlement has not greatly changed. Although there has been some spreading of people out into the clays the traditional areas of settlement - the Nahl Hills and Gedaref Ridge with their wells, and the River Rahad - still contain the great majority of the population.

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CHAPTER IV.

TRIBAL MIXING IN GEDAREF.

INTRODUCTION.

The degree of tribal mixing in Gedaref is remarkable (fig. 33). This is important both in itself and because the different use made of the four water environments in the area is partially explicable in terms of the different people who inhabit it.

FIGURE 33.

POPULATION OF GEDAREF DISTRICT BY GROUPS, 1955.

(Compiled from interim reports of the First Population Census of Sudan.)

	Percentage
All Arabs (including those from west)	40·5
West Africans	35·8
Others (mainly Western Sudanese negroes)	23·7

(Note. Mather[1] quotes Gedaref District records for 1947. According to them local Arabs formed 36 per cent. of the population. Western Sudanese immigrants, whether arab or negro, formed 20 per cent., and 44 per cent. were West African.)

Gedaref has attracted immigrants for a variety of reasons. The population vacuum after the Mahdia, combined with a relative abundance of cultivable land initially drew immigrants to the area. Later new techniques made possible the development of new sources of water supply and increased the capacity of the area to absorb still

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1. Mather, 1954; p. 215.

more people. The plentifulness of land explains two features of Gedaref which are unusual in Africa. First, men of different tribes and nationalities are living peacefully and cultivating side by side. Secondly, most of the immigrants possess their own farms, a situation rare in Africa, where, though the movement of cultivators is commonplace, peasant migration is generally from the village to the town. (The current extensive mechanisation of land may eventually limit or halt the intake of new settlers.)

The fundamental differences in social custom, attitudes and behaviour of these varied peoples is to some extent concealed by the common pattern of life adopted by the immigrants who are quick to adapt to the cultivation techniques necessary for the heavy clays of the region and to imitate the original inhabitants in dress, house construction and language. Assimilation is most rapid where the immigrants consciously plan to settle in the area for an appreciable period. But the bulk of Gedaref's inhabitants regard themselves as birds of passage. Most are pilgrims on their way to Mecca.

WEST AFRICANS AND THE PILGRIMAGE.

The great majority of pilgrims leaving the Sudan for Mecca are West Africans. In 1938 only 26 per cent. of the pilgrims embarking at Suakin were Sudanese[2] (a percentage which has fallen since then as better travel facilities have encouraged more West Africans).

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2. Suakin port control files.

Kassala Province contains 26 per cent. of the West Africans in the Sudan (only Blue Nile Province with 37 per cent. has more[3]).

Ever since the Western Sudan was converted to Islam between the tenth and thirteenth centuries the pious have made their way to Mecca. The route they have used is the grassland route which has long been one of the principal migration highways of Africa. Where once pilgrimage was an achievement of the exceptionally persistent and devout the development of transport and communications and the security of travel brought by colonialism to savanna Africa have made it possible for the broad mass of people. (From Nigeria alone there are 70,000 people en route at any one time.[4]) These developments, too, have made it possible for the pilgrims to bring their dependents with them, an important fact given the strength of the family unit in West Africa. As early as 1938, 47 per cent. of the West African pilgrims passing through Suakin were women.[5]

Rich pilgrims may make the journey to Mecca by air; the poor, travelling overland, take longer. A journey from Kano to Eastern Sudan takes three to four weeks and costs about £30. Few families have saved the return fare before leaving Nigeria; this omission, coupled with the often unexpected expenses at Mecca, make a pause to earn money somewhere on the route normal. Even if the pilgrim comes

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3. Henin, 1961.
4. Nigerian government estimates.
5. Suakin port control files.

from west of Nigeria he seldom stops in French Africa or the remote and backward areas of the Western Sudan. Most prefer to halt in the Blue Nile Province or Eastern Sudan where economic opportunities are greater(fig. 34). Here there are large empty areas suitable for cultivation and West Africans may own land without restriction. Wage earning employment in the dry season is available in the irrigated areas of the Gash and the Gezira and on the mechanical crop production schemes of Blue Nile and Gedaref. The rivers Atbara and Rahad support small fishing industries and the flood land along their banks can be turned to profit through market gardening. In the areas of economic advantage the pilgrims tend to halt where large numbers of their fellow-countrymen are already living.

FIGURE 34.

AREA WHERE IMMIGRANTS ENTERING GEDAREF FROM THE WEST MADE THEIR FIRST HALT.

Percentage of immigrants stopping at:-	Home of immigrant.			
	West of Nigeria	Nigeria	East of Nigeria	Western Sudan
French & Sudanese Darfur	3	2	0	-
Kordofan	7	17	9	4
Blue Nile	7	15	8	10
Khartoum	10	0	3	5
Gedaref District	73	56	73	75
East of Gedaref District including Mecca	0	10	7	6
Total	100	100	100	100

(Table compiled from data from four villages, including Abu Hamir, Senegal and Ruwina. Total size of sample = 371.)

Figure 35 shows that only a small proportion of the pilgrims travel direct to Mecca without a halt. The vast majority are in the Sudan for several years before they complete the Haj. Less than a third who have been away for under five years have been to Mecca but the proportion rises to 90 per cent. for those who have been away for over thirty years showing that most finally achieve their object.

FIGURE 35.

PILGRIM IMMIGRANTS IN GEDAREF.

Percentage of those who had been to Mecca according to the length of time they had been away from home.

Time from home in years.	Percentage who have been to Mecca. West Africans.	Western Sudanese.
0 - 5	31	19
6 - 10	53	2
11 - 15	70	12
16 - 20	65	8
21 - 25	58	0
26 - 30	69	0
over 31	90	0
born in Gedaref District	40	5

(Table compiled from data from 7 villages including Abu Kashma, Abu Hamir, Ruwina and Senegal. Total size of sample = 654.)

A great many pilgrims do in fact remain in the Sudan and the number of these appears to be increasing. The fact that he has his dependents with him and that he is surrounded by fellow-tribesmen

makes a pilgrim less eager to return. In a country where largesse is more esteemed than thrift, and where constant demands are made upon a pilgrim's hospitality by fellow-tribesmen and kinsfolk passing through the area, it is not easy for a lingerer to amass the 30 L.S. needed for the return journey by each member of his family. It is true, too, that the bulk of the pilgrims come from the crowded emirates of Sokoto and Kano in Northern Nigeria, where land is scarce and overcrowding oonsiderable, factors which may make them disinclined to leave their new area of settlement (fig. 36). Most of the so-called pilgrim settlers are not settlers in the truest sense but lingerers. They always intend to return and most of them assure one that they are on the point of leaving as soon as funds are available. Only a small proportion will admit to plans to stay for several years. But enthusiasm to leave is more apparent than real. Despite the Nigerian government's standing offer to pay the fares of impoverished Nigerians in the Sudan, only five people in Gedaref took advantage of this in 1961. The longer they stay the more dependents and commitments they acquire and the chances of returning grow slimmer.

FIGURE 36.

HAUSA SETTLERS IN GEDAREF BY PLACE OF BIRTH.

(a) Percentage of those born in:

Nigeria	78
East of Nigeria	4
Darfur	0
Kordofan	2
Blue Nile	5
Gedaref District	11
Total	100

(b) Percentage distribution of those born in Nigeria by emirates.

Sokoto	31
Katsina	3
Zaria	1
Daura	4
Kano	26
Bauchi	3
Hadeja	2
Bornu	5
Total	78

(Table compiled from data from 5 villages including Abu Kashma, Calipha and Abu Hamir. Total size of sample = 249)

Neither distance, fatigue nor time, as Burkhardt pointed out,[6] are of much account with those who make the pilgrimage. About 53 per cent. of the West Africans in the villages studied had been to Mecca; there were a number from Darfur, but very few from among the Arab tribes living in Kassala Province. It is moreover very noticeable that the children of pilgrims who are born in the Sudan seldom go on pilgrimage. Only two fifths of the West Africans born in the Sudan and surveyed in Gedaref had seen Mecca (see fig. 35). There are now growing up in Gedaref an increasing number of West

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6. Burkhardt, 1819; p. 412.

Africans who have been born in Sudan (see fig. 36). The figures for the Hausa are not likely to be atypical. Of the Hausa in the villages surveyed 18 per cent. were born in Sudan, the figure rising to 28 per cent. in the oldest village. With the present balance of the sexes and the high fertility of the West Africans the numbers of the group are rapidly increasing. West Africans born in Sudan do not think of themselves as belonging to their parents' country but would for the most part like to be regarded as Sudanese. They are not, however, generally accepted as such and as a result take refuge in strong concepts of tribalism, rather than nationalism.

WESTERN SUDANESE SETTLERS.

Many of the Western Sudanese living in Gedaref are there for reasons other than the pilgrimage. The true pilgrims from this group seldom linger long in Gedaref and the majority seen who had been to Mecca had been away from home for less than five years (see fig. 35).

The bulk of the Western Sudanese immigrants fall into two different categories. First there are the true settlers. During and after the Mahdia Western Sudanese soldiers and camp followers settled in Gedaref. They joined the Takruri colonists and freed slaves of the Arabs who were already in the area. These people regarded Gedaref as their home and their descendants have no intention of returning to the West. The fact that Qala'en Nahl and Gedaref.

South are under Sudanese nazirs means that the settlers are governed by a fellow-tribesman and they feel that these parts of Gedaref belong to them at least as much as to anyone else. As time passed and travel facilities improved the settlers were joined by fellow villagers and relatives from the West. Darfur is at present a population deficit area because of the number of people migrating from it to seek better economic opportunities in the East. The trickle of true settlers travelling with their goods and families continues, Huweig being a good example of a recently formed settler village.

The second group of Western Sudanese immigrants is a result of a more temporary kind of migration, and this influx has recently assumed large proportions. Young, single men leave Darfur or Kordofan to work as labourers for a year or two until they have acquired enough money to return home, acquire a wife and set up house for themselves. These people seldom bother to farm in their own right. They usually work with an Arab or settled Western Sudanese family for an agricultural season. They contract to work for three or four months at about 3 L.S.[7] a month, all food provided. They live on the fields of the farm rather than becoming members of the households of their employers. In the dry season they may work for a gum owner or pick cotton in Blue Nile Province. Others work as labourers in

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7. The Sudanese pound (L.S.) is equal to a pound sterling.

Gedaref Town. Many come annually to work in the Gedaref mechanized schemes, which depend on this type of Western Sudanese labour for their harvesting.

Such labourers are very much birds of passage. Although many drift into Gedaref Town at the end of the harvesting season they do not mean to settle. During work they are housed together in picker camps. Where they do settle to cultivate in their own right they usually go to a pioneer village, for example one by a mechanized hafir where there is new land and thus opportunity for quick profits. After a few years the farmers will leave and either move elsewhere or return to Darfur. Among the Western Sudanese there are some who are chronic wanderers. They keep moving from place to place, cultivating here, labouring there. They are usually single men or else childless married couples. Because they never settle anywhere for long they have no feeling of belonging to a particular district. This makes them the most mobile element of the population, swift to move to a new water point when it is established or improved and swift to abandon a village should its water supplies become inadequate.

Indeed compared with the West Africans who might be expected to move about in search of profit and in order to reach Mecca, the Western Sudanese show less ability to settle down. A survey showed that 58 per cent. had been less than five years at their last place

of stay, compared with 35-45 per cent. for pilgrim westerners. Fewer Western Sudanese than West Africans had spent fifteen or more years at their previous villages. Yet many of the Western Sudanese were born in Gedaref District and had no real need to move at all (fig. 37). Another survey, of hafir villages only, revealed that 40 per cent. of the Western Sudanese had lived in more than two other villages compared with 26-32 per cent. for West Africans. Only about a quarter of them compared with over a third of the pilgrims had come to this village as their first move, despite the fact that the pilgrims had come so far from their homes (fig. 38).

FIGURE 37:

IMMIGRANTS IN GEDAREF.

Length of time spent in villages where halts were made during the journey from the west.

Percentage of population stopping at each village for:-	Home of immigrant. Beyond Nigeria	Nigeria	East of Nigeria	Western Sudan
1 year	19	15	7	17
2 years	13	15	10	15
0 - 5 years	45	45	35	58
6 - 10 years	29	32	37	23
11 - 15 years	9	8	9	7
over 15 years	17	15	19	12

(Table compiled from data from 6 villages, including Abu Hamir, Senegal, Abu Kashma and Ruwina. Total size of sample = 325.)

FIGURE 38.

HAFIR VILLAGES.

Percentage of members of main tribal groups making one or more halts of several years between leaving home and arriving at the hafir.

	Direct from home.	One halt made.	More than one halt made.	Total.
Western Sudanese	27	33	40	100
West Africans from Nigeria	39	30	31	100
West Africans from east of Nigeria	37	39	24	100

(This table was compiled from data from 3 hafir villages including Abu Hamir and Abu Kashma. Total size of sample = 376.)

LOCAL ARABS.

The original Arab inhabitants have reconciled themselves to the fact that their traditional tribal lands are now shared with Western Sudanese and West Africans. Because of their longer occupation of the area, however, they have strong concepts of their relationship to the land. A Gedaref Arab is reluctant to leave the village of his fathers and the grazing lands of his tribe, even should water supplies become very inadequate.

DISTRIBUTION OF TRIBES.

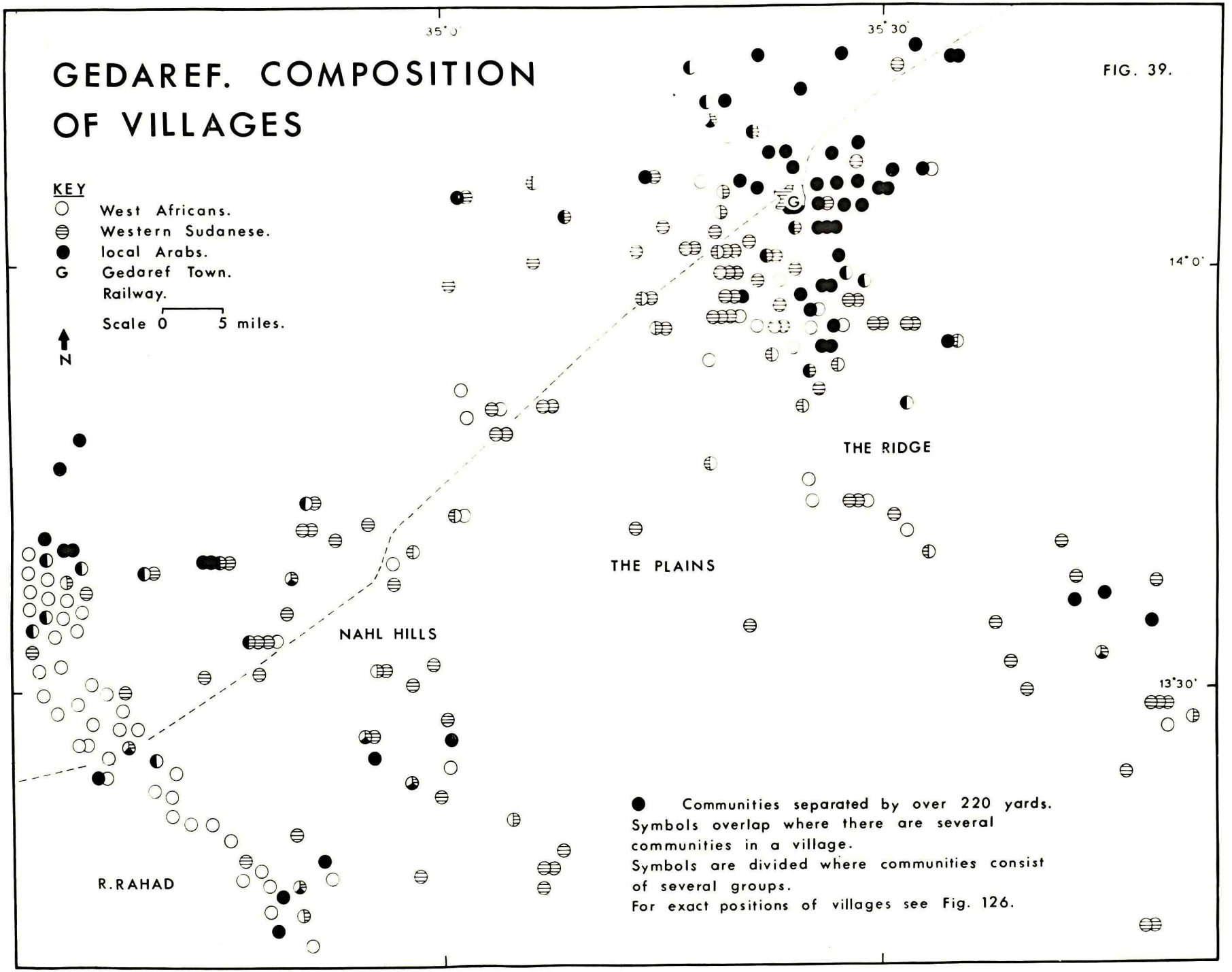
Partly as a result of historical and political circumstances the

three groups of peoples in Gedaref are not evenly distributed throughout the area.

Local Arabs.

Nearly all the original Arab inhabitants are found in the villages which they occupied before the Mahdia, in the hills of Qala'en Nahl or along the Gedaref ridge (fig. 39). Because the leader of the Shukriya was given a nazirship by the British, virtually all the Shukriya, together with lesser tribes dependent on them, live in Gedaref North. The Dubanya who used to graze the southern areas between the Rahad and the Atbara were decimated during the Mahdia. The remainder were formed into a small khut in the east of the district. Here they occupy the sites of the nomadic camps they held before the Mahdia, most of which are now permanent villages. The Jaalin, who fled to the Atbara and later to the Settit under the Egyptian occupation, have for the most part returned. Some went back to Shendi after the general amnesty. Others, previously expelled from villages within forty miles of Gedaref, returned to cluster round the town.

The Arabs have never returned in great numbers to the River Rahad. There are several possible reasons for this. At the end of the Mahdia there were not enough Arabs to reoccupy all the old villages. As the Rahad area had in the meantime largely reverted


GEDAREF. COMPOSITION OF VILLAGES
FIG. 39.
KEY
West Africans.
Western Sudanese.
local Arabs.
G Gedaref Town.
Railway.
Scale 0 5 miles.
N
35°0'
35°30'
14°0'
13°30'
THE RIDGE
THE PLAINS
NAHL HILLS
R.RAHAD
Communities separated by over 220 yards.
Symbols overlap where there are several communities in a village.
Symbols are divided where communities consist of several groups.
For exact positions of villages see Fig. 126.

to bush the refugees returned to the more easily cleared lands round the foot of the hills. In any case they may have been reluctant to return to village sites on the east bank, for except in the far north of the area studied this bank now lies in the administrative district of a Western Sudanese nazir. Moreover, many of the Arab villages were probably not used by Arabs for permanent settlements. They used them as nomadic dry season camps and left behind slaves who were responsible for cultivating in the rains. When slavery was abolished many of these villages were not re-established. Although there are a few Arab villages all along the Rahad the bulk of the Arabs are in the north near Mafaza, a market exchange centre for nomads and agriculturalists on the northern fringes of settlement, which lies in the Arab administered district of Gedaref North. These northern people are mainly Cuahla or Rufa'a, tribes whose main areas of settlement lie to the north of the area studied. In the south there are the fragmented remnants of the Hammada, the bulk of whom have not returned from their Dinder refuge.

There are a few new Arab villages which have budded off from old established villages as the population has increased. These offshoots are found mainly near the Gedaref ridge. Here long and crowded occupation has resulted in the exhaustion and scarcity of land. As the use of modern techniques has made water available

further from the main ridge some members of the old villages have moved outwards to obtain new land.

Western Sudanese.

The Western Sudanese have settled in two rather different environments. The early immigrants established themselves in old Arab village sites which had not been reoccupied. Few, however, [redacted] settled in the Arab nazirate of Gedaref North as land was available in the two Sudanese nazirates. There are relatively few [redacted] along the Rahad and their numbers here are decreasing. On the whole, settled family villages are confined to the hill groups. Even recent immigrants from Darfur, as for example those from Huweig, have chosen to settle in the hills.

Those who have no dependents have moved out into the pioneer fringe areas. They are found in the south of the district and in the newly opened areas of the clay plains, near hafirs, deep bores or along the railway line. These new settlement areas became available as immigrants flocked in; naturally it was the immigrants who seized the new opportunity rather than the established Arabs, who were set in their ways and had family and tribal commitments.

In Gedaref District there is no West African nazirate, so that West African immigrants must settle under either an Arab or a Western Sudanese ruler. While Gedaref North has shown reluctance to accept

Western Sudanese it has not excluded West Africans. There are, however, few immigrants in the District because water supplies are generally short, rainfall is marginal for cultivation and there are better watered areas elsewhere. Moreover, in an effort to strengthen their power by increasing the number over whom they rule there has been rivalry between the two Western Sudanese nazirs to encourage settlers.

West Africans.

The early West African arrivals settled about forty years ago in the two hill areas or near the Arabs in the northern part of the River Rahad. Later, as population increased and less land was available near the hills, they spread further south along the Rahad and into the southern part of Gedaref ridge. As new water points have developed some have moved out into the clay plain along the railway or by deep bores. They have been less willing to settle in hafir villages. They fear that the hafirs will not contain water all the year, and as most West Africans have family commitments they are reluctant to move more than is necessary.

The position is summarized in Figure 40. It shows clearly the great dominance of the Arabs in the Arab-administered North and their scattering in the older parts of the Nahl Hills. The paucity of Western Sudanese in the North contrasts with their

dominance in the Western Sudanese administered South and the Hills. They are prominent too in the area of the Mechanical Crop Production Schemes, too pioneer-like for the Arabs and too dry for West Africans. Always without administrative protection, West Africans are found throughout the area but least in the North, where settlement has been stable over a long period and land is short. Their numbers in the South are greatest away from the old settled areas. Their dominance in the Rahad area arises mainly from the fact that no others were pressing to settle there, so the way was clear for foreign immigrants.

FIGURE 40.

DISTRIBUTION OF GROUPS BY VILLAGES.

Percentage of villages in each region containing members of the various groups.

	Local Arabs	Western Sudanese	West Africans
North Ridge	77	17	23
South Ridge	24	64	31
Nahl Hills	27	75	27
River Rahad	25	16	81
Plains	9	87	25

(A village was considered to contain members of a group if those members made up at least 10 per cent. of the village's population.)

Thus settlers in Gedaref are roughly distributed in accordance with political and historical circumstances. However, the rather

different means by which the various settlers earn their living also affects the settlement pattern. So, too, does their varying ability to cope with water shortages, but this depends on the flexibility of their ways of life and is dealt with in a later section.

MEANS OF EARNING A LIVING.

Basically everyone in the area requires land to cultivate. The most usual crops grown are dura for consumption and simsim for consumption and cash. Coming from areas of lighter soils most West Africans are accustomed to dukhn as a staple crop. Although it can be grown throughout Gedaref, yields are low on the clays, and most adapt to devoting the main area of their farms to dura. Cultivation commences in July at the beginning of the rains. Simsim is harvested in September and dura in about December. Agricultural operations are carried on by hand. (Grain is not broadcast, but planted in rows using a seluka, or digging-stick. Between-row weeding is necessary about a month after planting.)

Since land is now scarce round the heavily settled hill masses only a few newcomers, generally relatives, can be accepted into the old hill villages and given farms. The bulk of the newcomers are forced to settle in the pioneer areas. New land offers high yields and is a good incentive but West Africans are reluctant to expose their families to the hardships of these fringe areas. As yet there

is little general difficulty in obtaining land. The local chief is responsible for giving permission to clear land and for reallocating already used land. Rights to land are usufructarian, although there is also, in fact if not in theory, inheritance of land. No one may cultivate more than 200 feddans of land without the rural council's permission, but only an Arab would have the money for the labour or tractor necessary to plant such a large area.

When a person leaves a village the land he has cultivated reverts to the chief's control. If it is cleared the chief can reallocate it to a new settler, possibly charging a small sum because the new owner does not have to undertake clearing. The chief retains the profit. Within a pilgrim village where people are continually coming or going there is a high turnover in land ownership.

The most common subsidiary sources of income in Gedaref are gum gardens,[8] the ownership of flocks and herds and the ownership of riverain flood land for market gardening.

It seems that before the Mahdia the local Arabs picked gum arabic when they needed money, somewhat sporadically and with no proper allocation of trees. The hashab trees grew wild in the forest, usually occurring in mixed stands with other species. The Western Sudanese, who had a much higher regard for gum as a source

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8. Sudan produces 80 per cent. of the world's supply of gum arabic.

of income and who actually grew the hashab tree as part of a long term rotation in Darfur or Kordofan, acquired rights to certain areas of trees in Gedaref South and Qala'en Nahl; indeed, virtually all the gum trees are allocated to Western Sudanese. The Dubanya and other Arabs are unable to obtain rights to trees, for the Western Sudanese administration argues that they did not systematically pick them in the past. When new gum trees come up for allocation they are given to Western Sudanese immigrants. Since trees are scarce relatively few new settlers have them (fig. 41). In Gedaref North the trees are allocated only to Arabs.

FIGURE 41.

OWNERSHIP OF HASHAB (GUM ARABIC) GARDENS BY LENGTH OF RESIDENCE IN GEDAREF.

Time in Gedaref.	Percentage of those with hashab.
Born in Gedaref	56
20 years & over	50
15 - 19 years	25
10 - 14 "	20
5 - 9 "	0
0 - 4 "	0

(Table compiled from data from Kabaros, a forty-year-old Western Sudanese village in the Ridge.)

West Africans are almost never given gum trees. In part this is because the authorities are understandably unwilling to allocate

scarce resources to foreigners, but it is mainly because most West Africans are ignorant of these trees and have unfortunately displayed their ignorance by cutting them down while clearing fields. This has occurred especially along the Rahad where the West Africans are remote from Sudanese influences. Where the West Africans are French Darfurians, however, experienced in gum tapping, and where there is enough gum to go round, as at Abu Nagga and Abu Hamir, some have received gardens.

Free of the responsibilities of tapping gum or supervising pickers, West Africans are at liberty to undertake a regular dry season occupation for six months or more. Though undoubtedly profitable if gum prices are high, the possession of a gum garden results in considerable underemployment. Gum tapping begins at the end of November. Trees are tapped at intervals of about a month until March when the sap ceases to rise. The Arab or Western Sudanese is thus tied to his village and though he is occupied for perhaps only ten days each month there are usually no alternative sources of employment available. He is usually in a remote area, for gum forests exist only away from the main centres and where water supplies are inadequate for cultivation. As the dry season progresses, his time is increasingly spent in obtaining water for his daily needs.

For the Arabs in Gedaref there is still enormous prestige attached to the ownership of beasts, especially cattle. They are still regarded as the main form of capital investment, although, as one Arab put it, the more enlightened are now seeking to put their capital into tractors or lorries rather than into breed bulls. The number of animals owned has little to do with their usefulness for only a few milk beasts can be kept locally, the rest being given to nomads to herd for a small sum. Their enthusiasm for cattle has made the Arabs reluctant to settle in the more southern parts of the area. They particularly dread the insects found in the heavy bush and therefore avoid pioneer areas. The West Africans and West Sudanese, unhampered by beasts, have been able to move freely into the virgin lands of the Rahad and south.

Since everyone in Gedaref requires milk for their early morning tea every family tries to keep a goat or two.

Interest in cattle on the part of the Western Sudanese varies enormously. Those Sudanese who are baggara Arabs are naturally more interested in cattle than the negroid races of the Darfur highlands. Western Sudanese who have been long settled in Gedaref have had time to accumulate capital for herds. Indeed the Western Sudanese of certain older villages in the Gedaref Ridge had far more beasts than their neighbours, the Arab Dubanya at Assar. On the other hand the

chronic wanderers among the Western Sudanese seldom stay long enough anywhere to save enough to buy beasts. Moreover, they would not want to be impeded on their journeyings by animals. The same is true of the Western Sudanese labourers who come to earn money in Gedaref for a short period only.

In the same way most West Africans are initially reluctant to tie up their capital in beasts, though like the Western Sudanese and Arabs they will often have a small number of goats. Some of those living along the Rahad have no animals at all because of the unhealthy climate there during the rains and the high mortality rate. Moreover, those who think they are only staying for a season in a village before passing on will probably not bother with animals. Again, West Africans who want to go away to work in the dry season will not want to be encumbered with beasts. Since even goats have to be herded, West Africans are often reluctant to start keeping beasts until there are enough other people in the villages prepared to do so too, so that the expense of a herd boy can be shared.

When pilgrims have become more permanently settled they may acquire cattle. Third generation settlers may have as many beasts as the poorer Arabs near them. Indeed the best cattle seen belonged to a Hausa village forty years old. This shows a remarkable degree of adaptation to Arab customs, for the Hausa do not keep cattle in

Nigeria, but have acquired the techniques since coming to Sudan.

The results of these varying attitudes to acquiring cattle are shown in the accompanying table (fig. 42).

FIGURE 42.

Percentage of villages without cattle.

Arab Villages	0
Western Sudanese Villages	16
West African Villages	24

(Figures refer to all villages in the area studied.)

In Gedaref a certain number of people earn money in the early part of the dry season by market gardening. Most of the area under vegetables is along the Rahad where the river floods the silty banks. There are occasional patches of irrigated cultivation both along the Rahad and in parts of the central basalt ridge where adequate rain water is available. Owing to capital requirements - a pump or saqia and possibly a well - ownership is mainly by wealthy Arabs. If, however, this type of vegetable growing represents too long a term investment and too much expense for a newcomer (pumps cost 100 L.S. upwards), flood land market gardening requires little capital. Gerf or flood land is obtained by payment of a small annual rent varying from 1 L.S. to 5 L.S. according to the size of holding. Very few

Arabs or Western Sudanese are interested in gerf (fig. 43). It would not be profitable to hire labour to work such small areas of land and they do not relish doing the work themselves. The West Africans, however, see it as an excellent source of dry season profit and as a means of hastening them on the way to Mecca. This, together with the fact that many are fishermen, accounts for the fact that they settle along the Rahad, particularly in the South.

FIGURE 43.

R. RAHAD. OWNERSHIP OF GERF BY GROUPS.

Percentage of each group possessing gerf.

Arabs (Calipha)	5	
Barnu (Ruwina)	44	
Hausa (Arzuga)	50	
Hausa (Calipha)	60	
Fulani (Calipha)	68	
Senegalese (Hillat Senegal)	59 + 23	awaiting to be allocated it.

Note. A low proportion of Barnu had gerf because their village lay in the north where little was available.

(Table compiled from data from 4 villages. Total size of sample = 301.)

Differences in dry season occupation sharply distinguish the groups in the area. Figure 44 illustrates these differences as between Arabs and West Africans in the similar environment of the Rahad. It indicates the lack of interest of the Arab in gerf,

FIGURE 44.

R. RAHAD. DRY SEASON EMPLOYMENT BY GROUPS.

Percentage of each group practising the following dry season occupations:-

	Arabs (Calipha)	Hausa (Calipha)	Hausa (Arzuga)	Bornu (Ruwina)	Senegalese (Hillat Senegal)
Casual jobbing (including house building)	24	3	5	0	18
Regular wage-earning (unskilled or semi-skilled) (i) while living at home	5	20	17	0	15
(ii) while living away from home (including cotton pickers & urban workers)	2	5	35	18	11
Transport (camels)	24	4	11	18	9
Commerce (including shopkeepers)	2	24	2	2	4
Skilled crafts	0	16	7	0	7
Fishing	4	8	0	26	27
Religious instructors	0	5	5	18	0
Unemployed	39	15	18	18	9
Totals	100	100	100	100	100

fishing, crafts, commerce and wage-earning, which occupy the West Africans. Arabs undertaking employment prefer to use their nomadic skills with animals or use their beasts for transporting forest products. Compared with the West Africans, whose idle and casually employed are never more than 27 per cent., over 60 per cent. of the Arabs either do nothing or only undertake casual jobs.

In general the Arab has few craft skills and values his leisure time. He comes from the wealthiest and most influential group. Admittedly many Arabs have remained simple peasant farmers, bearing as heavy a burden of recurring debt as anyone else, but the more successful have profited from their long tenure in the area to accumulate sufficient capital to invest in animals, machinery or business and to hire labour. The West African is a complete contrast. Anxious to reach Mecca and coming from a society where industry is highly regarded, he is keen to use his craft skills and content to work for an employer during the dry season. The money he acquires is not invested for further profit but, is, ideally, earmarked for the pilgrimage. The Western Sudanese have as little regard for hard work as the Arab, but lacking skills are prepared to undertake paid labour if necessary. Indeed, Arabs frequently employ members of the other groups. Western Sudanese work for them as gum pickers and agricultural labourers. West African men, farmers in their own

right, will not do this, but are prepared to allow their women to undertake domestic tasks for Arab households. In a sample of twenty-one Arab families at Calipha over two-thirds employed Hausa women regularly in this capacity.

The action of government and local authorities tends to maintain this economic stratification, the argument being that better jobs should be reserved for nationals.

DIFFERENCES IN SOCIAL LIFE.

Generally throughout savanna Africa the basic social and economic unit is that of the extended family. And it is within this framework, with its mutual rights and obligations, that most of the more settled people of Gedaref live. Society is seen at its most patriarchal in the old Arab villages, where the heads of the most prominent families in the community may assume responsibility for all the relatives within their compounds, including able-bodied male householders with families of their own. Among newer Western Sudanese and West African immigrants, however, the family unit is very much smaller. For purely practical and financial reasons a pilgrim is seldom accompanied by more than his closest relatives. The weak and frail are left behind. Among the Western Sudanese the more stable will arrive surrounded by his family. Thus at Huweig, a six year-old Western Sudanese village established in the traditional

settlement area of the Nahl hills by people most of whom had come direct from Darfur, the average size of family was 5·6 persons. There were no single men and only two childless couples. Immigrants of this kind form a small minority, however. The Western Sudanese settlers in pioneer areas and the labourers are mostly young single men.

The contrast in family size between West Africans and Western Sudanese is clearly shown in the accompanying table (fig. 45). Both Abu Kashma and Abu Hamir are new hafir villages with young pioneer settlers. Yet the West Africans have an average family size of 4·6 persons and only 29 per cent. consisted of one or two people, while in comparison the Western Sudanese had an average family size of 2·8 persons, and 53 per cent. of their households had only one or two people. These figures are not unique. In another hafir village 91 per cent. of the West Africans were married compared with only 41 per cent. of the Western Sudanese. With their much higher regard for family life it is almost inconceivable to most West Africans and particularly Hausa that a healthy man should not have a wife. Even where a Western Sudanese immigrant is married he does not necessarily want children, since a woman unhampered by offspring can work in the fields. Many Western Sudanese take precautions against having children and the incidence of venereal disease among

them is very high, so that often one of the partners to a marriage is sterile. West Africans for the most part have large families.

FIGURE 45.

HAFIR VILLAGES: SIZE OF FAMILY.

Number of households composed of:-

No. of Members.	W. African.	W. Sudanese.
1	4	15
2	16	14
3	6	7
4	13	5
5	5	5
6	7	0
7	4	0
8	5	0
9	0	1
10	1	1
over 10	1	0
	62	48

(The W. African figures are from Abu Kashma.
The W. Sudanese " " " Abu Hamir.
Neither village had a large enough number of people from both groups for it to be used alone.)

It seems likely that the older Hausa villages will acquire the same kind of population structure as the Arab villages as, with the passage of time, families once more become extended. Indeed, the forty year-old village of Arzuga, over one third of whose families

had been in the village less than ten years, had an average family size of 5·5 persons which compares well with family sizes of 7·2, 6.0 and 6·2 persons in Arab villages studied. These were re-established immediately after the Mahdia and have no newcomers. Only 22 per cent. of Arzuga's families had only two adults, normally a husband and wife. In 40 per cent. of the families there were more than four adults, showing a growing accumulation of elderly relatives and dependent kinsfolk.

It seems, therefore, that there is considerable difference in the natural rate of increase of the various groups in Gedaref. Given time it is likely that West African families will grow at least as large as Arab families if not larger, while the Western Sudanese appear to lag behind. Taking these facts of natural increase together with the great immigration of West Africans and Western Sudanese it seems that the West African element in Gedaref's population is growing considerably faster than that of the other two groups and may soon become numerically dominant.

In all the tribal groups in the area studied the women occupy an inferior position in accordance with the generally accepted traditions of Islam. But whereas a West African would be most reluctant for his wife to work in the fields this activity is common in most sections of Western Sudanese society, and among local Arabs a woman

may occasionally (for example, if without a husband) farm in her own right. Seclusion of women is common in all groups, though the lower class of Arab regards it as an ideal not commonly attainable. The Western Sudanese woman has more independence and in extreme cases seems to be completely self-supporting, farming, brewing, or engaging in prostitution. The strictness with which West Africans seclude their women is but one aspect of their stricter religious behaviour. They are more zealous in their praying, have an abhorrence for lusts of the flesh and are critical of the lukewarmness of the Arab's religious behaviour. The religion of many Western Sudanese, especially recent arrivals, is purely nominal.

Throughout the Gedaref area the Arabs tend to form a social elite. Non-Arab Sudanese and West Africans born in the country tend to conform to the external behaviour of the Arab group in order to win social acceptance. The Arabs tend to despise the rest of the population, regarding the non-Arab Sudanese as immoral and the West Africans as unnecessarily puritanical and rather primitive. The Western Sudanese tend to link themselves with the Arab on grounds of nationality. Perhaps because they too are newcomers to the area they are more critical than the Arabs of West Africans.

These are the views most commonly expressed to one and those cropping up most frequently in conversation. As in many rural areas,

however, it is a matter of the bark being worse than the bite. In practice, whatever they think of each other, members of different groups often get on remarkably well.

DIFFERENCES WITHIN GROUPS.

In any case within the groups themselves there is considerable variation. The Arab tribes with their close tribal structure represent a fairly uniform and cohesive way of life. There is, however, great variation among the Western Sudanese. Some of the arab tribes from Western Sudan are culturally as arab as those of Gedaref. They differ from them only in that, as the number of immigrants from each tribe are few and their villages scattered, the wider bond of their tribal structure has broken, and by the fact that they prefer to live in the southern districts along with fellow Sudanese from the same home area, even though these may be of negroid origin. Other tribes, who, despite claiming Arab descent, are obviously of very mixed origins physically, associate closely with the negroid Sudanese tribes. The West African group, comprising as it does all those Africans whose home is outside Sudan, includes people of very different origins and customs. The people of French Darfur have a history and social organisation very different from that of a large, compact and highly organised tribe such as the Hausa from Nigeria. The Bornu from Chad both geographically and

socially come in between these groups. The Fulani with their pale skins form a startling contrast to these negroid western peoples. Indeed with their nomadic traditions and Semitic origins they have a great deal in common with the Arabs.

Mather[9] thought that because of their appearance and behaviour the Fulani were readily accepted and assimilated by the Arabs of Sudan. In Gedaref, however, there are almost no signs of this happening, the Fulani being treated in the same way as other immigrants. Indeed the Fulani mix more with the Hausa than with any other tribe, no doubt because they lived together for centuries in Nigeria and from 1800 the settled Fulani had been rulers of the Habe emirates. Fulani from French Africa tend in the same way to mix with other tribes from the same area. There is indeed a very strong tendency for immigrants to mix with those tribes with which they share a common areal background.

There seems to be almost complete mixing between the negro and near negro tribes of Western Darfur. Some of the French Africans are from areas near Sudan which once formed part of the old Sultanate of Darfur and these mix freely with the Sudanese Darfurians. Bornu, too, are often found with the Sudanese. Bornu are a central sudanic people like the Darfurians and, moreover, some of them have been colonists in Darfur for well over 100 years. Actually the

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9. Mather, 1956; pp.129, 130.

Bourgu, one of the main groups from Darfur found in Gedaref, were not originally from Western Sudan. The name is not a tribal one, but a term given to groups of colonists entering Darfur from the west, in the seventeenth and eighteenth centuries.

The bulk of those from the French Sudan hold themselves apart from the Western Sudanese. In the main they mix only with members of their own tribe or, if there are not enough of these, with members of other tribes from the same area. The Nigerian pilgrims are virtually all Hausa, who are extremely conscious of their tribe. There are a few Bornu and Fulani who mix with them in the same villages but the Hausa are themselves seldom forced to mix with others as there are so many of them. If the pilgrims come from west of Nigeria it becomes extremely difficult to discover to what tribe they belong. When asked their tribe they give the name of the area from which they come. Probably there are so few members of individual tribes coming from as far as this that the pilgrims rely on areal rather than tribal ties. When asked their tribe all members of Hillat Senegal said they were Senegal, yet it was later discovered that two families could not understand the language spoken by the rest of the village. They had joined this village because the inhabitants came from their home country.

Thus by immigration much of Gedaref's population has cut itself off from the extended family system and from the full force of tribal ties. To a much greater extent than before immigrants are forced to mix not only with people of different tribes but even with people from different areas.

TRIBAL MIXING IN VILLAGES.

Many of Gedaref's peoples live in remarkably close contact with members of other groups. Of all the villages in the area studied only 45 per cent. consisted of a single tribe although a further 17 per cent. contained only tribes from the same group. The remaining 38 per cent. of villages contained members of different groups existing together in one continuous settlement in very close physical contact.

These figures take no account of settlements which are dispersed (i.e. where villagers share common water and shopping facilities but where the settlement consists of a series of small groups of dwellings or communities separated from each other by over two hundred and twenty yards of ground. These physically separate communities are treated as separate villages for statistical purposes, although several may share the same village name.) If these dispersed settlements were included among the mixed villages the proportion of villages containing several groups would rise considerably.[10] Here, however, contact between members of various groups or tribes is not as

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10. Nor is a village considered to be mixed if it contains a minority tribe comprising less than 10 per cent. of the village's population.

intensive as in the case of a single, physically homogenous "mixed" settlement.

Within the mixed villages, moreover, the members of the various constituent tribes are not randomly dispersed. People from each tribe live together in separate but contiguous quarters. The amount of mixing that goes on, particularly among women who are allowed a very limited neighbourhood of association, depends to a great extent on the shape of the village, which in turn is often determined by the topography. Where a mixed village is roughly circular, surrounding a water point, and the quarters radiate out from the centre, there will be considerable mixing among the various groups. Where, however, the village is elongated and consists of a line of tribal quarters there will be much less contact between tribes who are not contiguous with each other.

Whatever the shape of the village the degree of intertribal contact will depend on the number of people from each tribe. Where the individual tribal groups are large, a man has enough friends and neighbours without going beyond people of his own tribe. This situation can be seen in its extreme form in Gedaref Town, where individual tribal quarters may occupy many acres and consist of five hundred or more people. Where, however, a village consists of a few members from many tribes, one's neighbours will be people from several tribes (though they may be from the same areal group or home environment). Where most of the tribal communities are large, but where there are a few

members of another tribe or tribes, these minor groups may become assimilated into or adopted by one of the larger tribes [redacted]. Thus odd Bornu or Fellata from Nigeria are often accepted into a larger Hausa community.

Where a village has well developed tribal quarters each will normally have its leader or sheikh. There is need, however, for a unifying authority to represent the geographical entity of the whole village. There is therefore usually a head sheikh officially responsible to the local council for the whole village. He may be the sheikh of the tribe which has been longest in the village, or the sheikh of the largest tribe, but he will almost certainly be of a tribe acceptable to the district administration. Thus there is a bias in favour of head sheikhs of Western Sudanese negro stock in the two southern districts and of Shukriya ones in the northern district.

The most static villages in the area are the old Arab ones. Over half of them contain members of only one tribe, reflecting the close tribal structure of their life. Of the 36 per cent. of the Arab villages which contain more than one tribal group many are the large centres that have attracted people of all types. Arabs prefer to share their villages with West Africans rather than Western Sudanese unless they be members of the purer Arab tribes. The West African, being a foreigner, is felt to constitute less of a threat to Arab

authority; and because of his reputation for hard work and quiet living may be thought to be an asset to the village. Thus 27 per cent. of Arab villages have West Africans, compared with 22 per cent. containing Western Sudanese.

About 45 per cent. of the Western Sudanese villages contain members of only a single tribe, for many of the older Western Sudanese settlers particularly from Arab tribes prefer to live separately in their own villages. On the whole, however, among newer Western Sudanese immigrants tribal barriers have broken down, and members of the various negro and less arabized tribes, particularly those from Darfur, mix readily in the same village.

In the newer pioneer villages especially and in about 27 per cent. of all Western Sudanese villages there are West Africans. Where they consist of Bornu or tribes from French Darfur, mixing may be fairly free, but where they consist of other West African tribes, such as Hausa, these will form their own communities just as soon as numbers permit.

Over 55 per cent. of all West African villages consist only of West Africans. About 40 per cent. contain only a single tribe, usually Hausa and occasionally Bornu, when numbers are large enough to enable them to form their own villages. Where villages contain several West African tribes there is usually one which is dominant.

It takes under its wing members of other tribes which do not form large enough groups in the area to have their own villages. These lonely pilgrims readily find a home among members of a different tribe from their same home area.

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PART 2.

CHAPTER V.

THE HILLS OF QALA' EN NAHL.

HISTORICAL SUMMARY.

Hilltop settlements indicate that this area was settled much earlier than the Ridge but little certain knowledge emerges about settlement patterns until just before the Mahdia. In this period the Cuahla, Ricabin and Rufa'a seem to have moved south to fill the population vacuum created by the defeat of the Hammada by the Dubanya. Dinka, grazing the southern part of the area during the rains, settled there in villages such as Balos. The Fung maintained their outpost at Beila and small communities elsewhere. In the main range of the hills lay eight villages of the Sharifa, a small, markedly religious group, who claim to have practised a settled life in the area for over three hundred and fifty years.

RESETTLEMENT AND TRIBAL DISTRIBUTION.

There is much less continuity of settlement in the Hills than on the Ridge. Only eight (18 per cent) of the

present villages have been occupied from the pre-Mahdia period until today by the same tribes (fig.46). The remnant of population returning after the Mahdia was small, so small, indeed, that in all but three villages new Western Sudanese groups were able to settle beside them, to share their water, and eventually to become dominant in the village. As on the Ridge, Western Sudanese also took over abandoned Arab village sites such as Ban and Buweida.

FIGURE 46.

THE NAHL HILLS. AGE OF VILLAGES.

Period.	Number of villages formed during this period and existing in 1961.
Pre Mahdia	8
1884-1910	1
1911-1920	7
1921-1930	4
1931-1940	3
1941-1950	3
1951-1960	18
	44

The settlement of Western Sudanese began later in the Hills than in Gedaref, probably because fewer of the Mahdi's soldiers (who were recruited chiefly from the Western Sudan) had been long in the area during the campaigning. Nevertheless the area was put under Western

Sudanese rule, and a group of the Khalifa's descendants settled in retirement at Ban. Their presence attracted many Sudanese and West African followers of the Mahdi, both to Ban, which became one of the biggest villages, and to the district generally.

The inadequate water supply in the Hills, compared to that of the central part of the Ridge, was another reason for the slowness of Western Sudanese settlement. Until the time of the British administration there were wells in granite only, none in serpentine. A combination of gallits, jamams and wells sometimes enabled a remnant population to remain settled throughout the year, but their yield was scarcely encouraging. The first serpentine wells were opened up at Qala'en Nahl. The water supply potential of the site was obvious from the presence of a wide basin in the hills drained by a large khor. The quantity of water found at Nahl led the nazir to make it his headquarters.

During the period 1910-1920 Sudanese immigration continued and accelerated. Over 15 per cent of the present villages were founded in the decade. An era of peace led to a natural increase in population and the building up of new flocks and herds. Granite water-points became increasingly less able to support a settled population. Villages

reverted to the old Arab pattern of transhumance that had existed in eras of prosperity before the Mahdia. Later, the hafirs of Major Evans were designed to alleviate the water problems of the existing villages and did not on the whole generate new settlement.

During the next thirty years settlement expanded slowly. The number of new villages founded is misleading for at the same time poor water supplies were causing old sites to be abandoned. In the main region of the Hills it became clear that, given existing methods of obtaining water, the most suitable sites were already occupied. Only areas of very marginal water supply remained for the more courageous settlers. There was a second region of serpentine hills in the southern part of the district, but the thick bush and the difficulty of digging wells of adequate depth were considerable deterrents. Only one village was founded here.

With the excavation of mechanized hafirs settlement anormously increased. Though the hafirs were mainly designed to supplement the water supply of existing villages and to extend the utilisable area of the clay they in fact generated new villages. Between 1950 and 1960 over 40 per cent of the present villages were founded. In every case new hafirs have been an important, if not the only, source

of water supply.

LOCATION OF WATER POINTS AND VILLAGES.

All but three of the villages are sited on the pediment at the foot of the hills. Eight are in areas of serpentine. Thirty-two or almost three-quarters are in granite areas. The hill foot site has several advantages. Psychologically the people prefer their village to back on to a hill; it gives them a sense of security even though they do not expect to have to use its defensive possibilities today. Then the pediments at the foot of the hills in the basement complex are formed of firm sandy material. They are well drained and naturally lacking in thick herbaceous vegetation even in the rainy season. They are thus easily kept clean and free from flies. Trees such as habil which flourish on sandy soil retain their leaves far into the dry season and provide the village with shade. Most important of all, the hills and their pediments form the catchments for all the water supplies of the area. Gallits are found in the hills themselves, jamams in the pediment angles and wells, [redacted], in the pediment zone. Early hafirs were filled by direct run-off and relatively deep, useful ones could be sited close to the pediment area, clay being deep around granite hills. Mechanically excavated hafirs, however, are another case.

Out of fourteen, nine are sited close to their catchment areas. The clay here, adequate for the early hafir, has proved inadequate for the mechanized one, with consequent leaking. The fact is that these latest hafirs were not always sited where physical conditions were best. In all but four cases they were designed to relieve the inadequate water supplies of existing villages and were duly sited conveniently close to the village. In only two cases are mechanically-excavated hafirs khor-fed from a catchment area more than five miles away. Thus, whereas new hafirs have caused only five villages to be sited in the clays, seven villages using the hafirs as their main source of water have been formed on the nearest hills between one and three miles away.

The importance of hafirs has enormously increased in the area in the last sixty years and they are now the most used source of water. Over two-thirds of the 37 hafirs built in Gedaref District between 1930 and 1940 were sited in the Nahl Hills, where the needs were greatest and good sites most freely available. Although the Ridge has two and a half times as many villages as the Hills, the latter area has rather more hand-dug hafirs. The distribution of mechanically-excavated hafirs is similar. There are fourteen in the Hills; the Ridge has fewer than six.

The people of the Hills have become increasingly dependent on hafirs. In 1950 seventeen of the forty-four villages had wells and thirty had hafirs. By 1960, after the building of the mechanized hafirs, thirteen had wells and thirty-nine had hafirs. Another two used hafirs in neighbouring villages for several months of the year. Only one village never used hafir water.

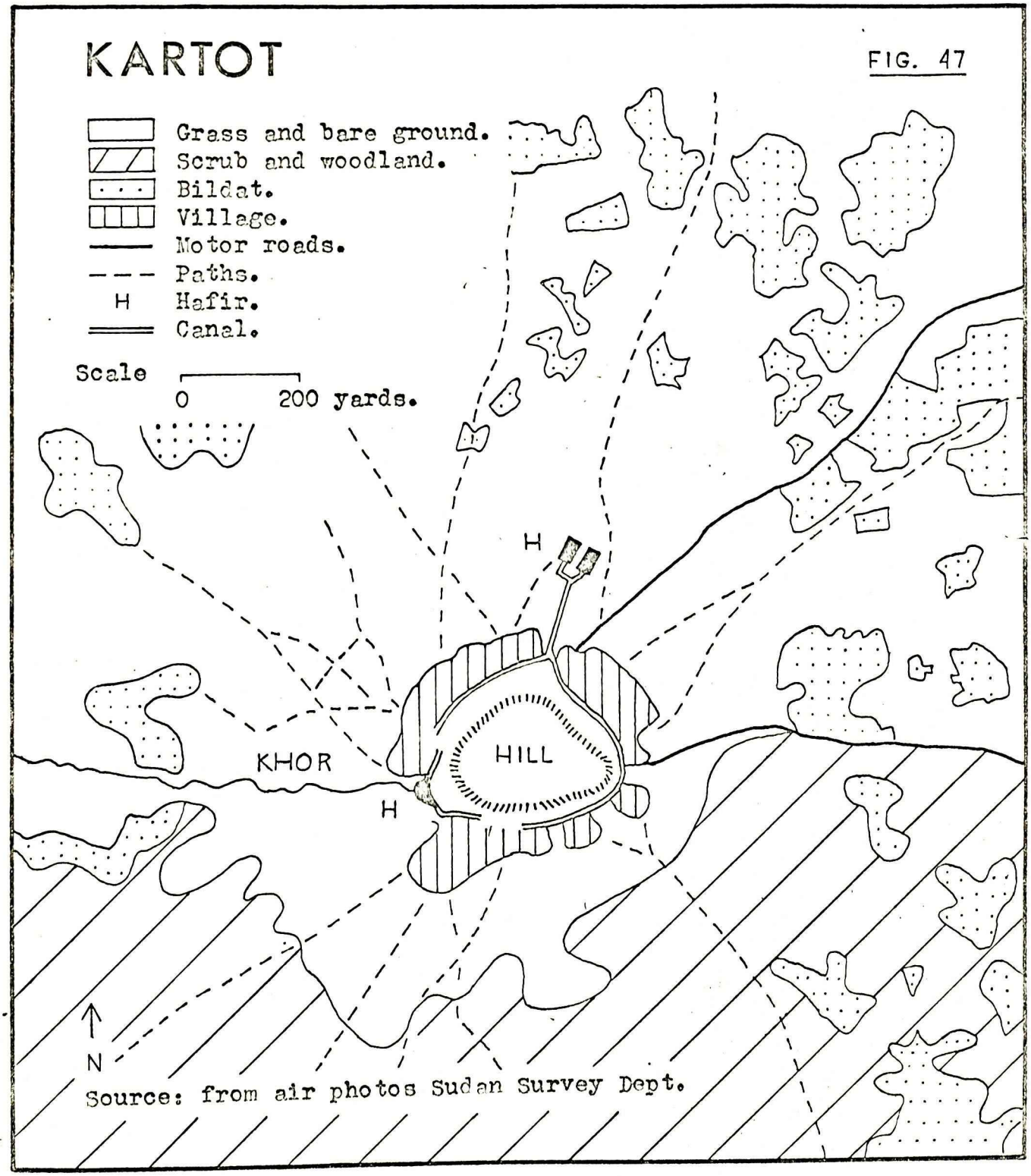
The low percentage of villages with wells is due to the generally unsatisfactory nature of underground water supplies in basement complex rocks. Granite wells tend to dry up completely or give only poor yields after January. With serpentine wells the initial digging is a difficult operation and the effort needed to draw water from a depth of forty to fifty-five metres is considerable. (Only 7 per cent of the 211 wells in the whole area studied are in granite and only 5 per cent in serpentine).

The popularity of the two other sources of water supply in the granite areas, gallits and jamams, is also declining. Eight of the villages now use gallits regularly and five use jamams. In 1950 the figures were thirteen and nine respectively, and in 1900 they were probably twice as high. Like granite wells gallits and jamams provide only seasonal supplies, and their yields are even lower. Thus we find that many of the new villages have never used these two sources of water and about half of the older ones have ceased to do

so.

SHAPE AND TRIBAL DISTRIBUTION OF VILLAGES.

The pediment zones of the serpentine hill masses, like the basalt pediment of the ridge, are in the main too large to influence the shape of villages. Granite hills are often small, however, and villages curve round them in order to keep to their pediments. The wells of villages in granite areas, unlike those elsewhere, are often sited some distance from the village, for since run-off from granite areas is seldom concentrated into khors, the well area is often severely flooded during the rains. The part of the pediment draining into hafirs is left clear of building. Where a village is very large and requires the whole pediment area, as with Kartot (fig.47), a canal is dug around the upper part of the pediment to lead run-off away to the hafir and to prevent the flooding of the village. The pediment area is thus usually too restricted for more than one village. Only seven out of twenty-eight hill sites contained more than one village. Villages in the Hills therefore tend, more than in the Ridge, to include peoples of mixed tribal origins (fig.48). 65 per cent contain more than one tribe and 22 per cent contain more than one tribal group. Only 41 per cent of the Arabs occupy single tribe


KARTOT
FIG. 47
Grass and bare ground.
Scrub and woodland.
Bildat.
Village.
Motor roads.
Paths.
H Hafir.
Canal.
Scale
0 200 yards.
H
KHOR
HILL
H
N
Source: from air photos Sudan Survey Dept.

villages. The figure for Arabs in the Ridge is over 10 per cent higher.

FIGURE 48.
THE NAHL HILLS. GROUP COMPOSITION OF VILLAGES.

Group.	Number of villages containing:-
Arabs only	5
Western Sudanese only	25
West Africans only	4
Arabs and Western Sudanese	2
Arabs and West Africans	2
Western Sudanese and West Africans	3
Arabs, Western Sudanese and West Africans	3
Total:	44

West Africans have not found the area generally attractive, largely because of its insufficient water supplies. They form large groups in three of the five well-watered villages in the serpentine areas, and are also found in the bigger centres, which have attracted people of all kinds. Rather surprisingly they have settled extensively by three of the hafirs in the clay plains. Perhaps these mechanically-excavated hafirs seem to offer more certain water supplies than sites in the granitic hills. Much of the West African immigration is more recent than that in the Ridge. It has been especially noticeable in the last ten years.

The proportion of Western Sudanese is similar to that in the other Western Sudanese administered area. They con-

tinue to enter the region and are found in 87 per cent of the villages formed in the last ten years. There are no new Arab villages. Arab communities are everywhere very small, and there is no need for them to divide because they have grown too large for the available supplies of land and water.

MOVEMENT OF VILLAGES FOR WATER AND LAND.

The life of settlements in the area is rendered uncertain by the marginal nature of water supplies. Inadequate water has caused the abandonment of at least four sites. It is significant that three of these have been resettled in the last few years and their inhabitants depend for extra water on new mechanized hafirs about five miles away. This resettlement seems to be the result of a relatively recent demand for new land. The presence of harig within daily walking distance of many villages shows that pressaure on land has not been great in the past. The new hafirs of the 1930's enabled only one agricultural camp to be developed, so that by the 1950's there was considerable overcultivation around larger villages. Despite the attraction of mechanized hafirs at least seven villages have recently been founded with disregard for available water supplies but with the intention of obtaining good land. In two cases they can be little more than agricultural camps and in only two villages are the

people truly settled. The other three villages are transhumant.

MOVEMENT OF VILLAGERS FOR WATER AND LAND.

Not only does lack of water make the very existence of villages more precarious than on the Ridge but it accentuates movements to obtain water. Figure 49 shows that nearly one-third of the villages in the area practise transhumance, that a further 20 per cent make local movements to obtain water, and that only half are fully settled.[1]

FIGURE 49. THE NAHL HILLS. WAYS OF LIFE.

Percentage of villagers practising the following ways of life:-

Fully settled	52
Making local movements to obtain water in the dry season	20
Transhumant	28
	100

Granite wells and hand-dug hafirs never provided enough water for villages in the dry season and so a transhumant pattern of life was adopted. To Arabs with a tradition of nomadism and movement on behalf of their

---

[1] (10 years ago, however, 78 per cent of the villages were transhumant and only the 10 per cent in the serpentine areas were settled. There were virtually no local movements for water on a village scale although individuals may have fetched water in this way. In every case local movements today are related to the use of mechanized hafirs, which have been responsible for the increase in the settled population).

beasts this transhumance was readily acceptable. When serpentine wells were opened, the ease of extracting water was not such as to encourage the abandonment of transhumance. Recently the Qala'en Nahl bore in the serpentine has attracted occasional water carriers from granite villages to the north, but, though extraction is easy, yields are not high enough to water outlying villages regularly as well as the town itself.

Today, although the incidence of transhumance has decreased, there is considerable variation in the need for it from year to year. This variation depends partly on the state of repair of hafirs but mostly on rainfall. When hafirs were new and in good condition, as few as 19 per cent of the villages were transhumant. In a year of poor rains such as 1960-1, the figure was as high as 38 per cent. This uncertainty as to whether or not transhumance will be necessary in a given year, means that ways of life need to be more adaptable in the Hills than elsewhere.

Most of the transhumance, whether by Arabs or by immigrant groups is traditional in form: inadequate water in the dry season forces a move to the R.Rahad. But there are exceptions. Since the development of mechanized hafirs four villages (two of them new) make a transhumant move to

a hafir site in the Hills, rather than to the river. One of the features of transhumance in the area is that though traditional in character it is adopted by recent arrivals. In the last decade six new villages have voluntarily accepted the necessity for transhumance, settling in an area of inadequate water to obtain better land. Three of these were originally river villages which practise transhumance for economic and agricultural reasons. A brief description of their practises precedes a more detailed description of the traditional transhumance pattern.

RECENT AGRICULTURAL MIGRATIONS.

This form of transhumance combines the use of the hill areas for growing grain with the use of the riverain area to produce gerf crops. The rainy season is spent in the hill areas where soils are less liable to flooding than near the river, and where there is less chance of birds damaging the crop. The riverain area is avoided at a time when it is very unhealthy and unpleasant. After harvest a return is made to the river as soon as the floods have subsided and while there is still time to grow tomatoes and vegetables.

The people who practise this way of life are riverain

West Africans and Western Sudanese. They are found in the south (fig.50) for only in this area of the Hills is land freely available. Moreover, it is the southern part of the riverain area that is most unpleasant in the rains, for flood water often enters the houses of the villages sited too close to the river. Their rainy season villages have typical hill foot sites. Two of their dry season villages are typical camps and they are the only tribe to occupy the site. The village of Shangiya, however, started as an agricultural camp for Hausa from several villages. It is now a village in its own right and people have no special dry season camp. They have, however, retained gerf in their former villages.

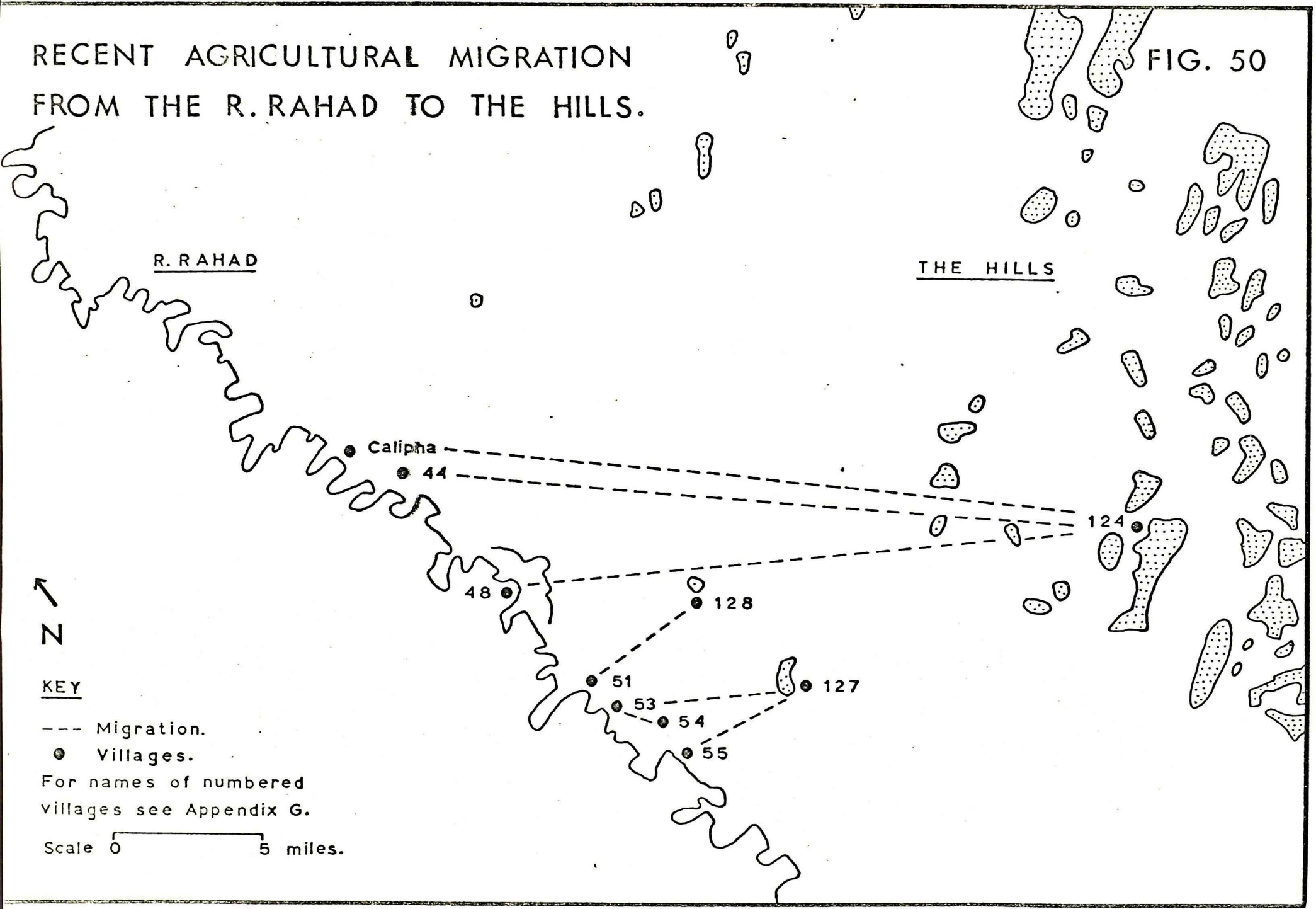
TRADITIONAL TRANSHUMANCE.

For those practising the traditional form of transhumance the move to the dry season camp is definite, regular and organized.

A village always moves to the same camp site (fig.51). The houses built there are basically the same as those found in the Hills, but as the camp dwellings are only used for four months in the dry season, they are often less substantial and spacious. In most camps houses are left standing from year to

RECENT AGRICULTURAL MIGRATION FROM THE R. RAHAD TO THE HILLS.

FIG. 50



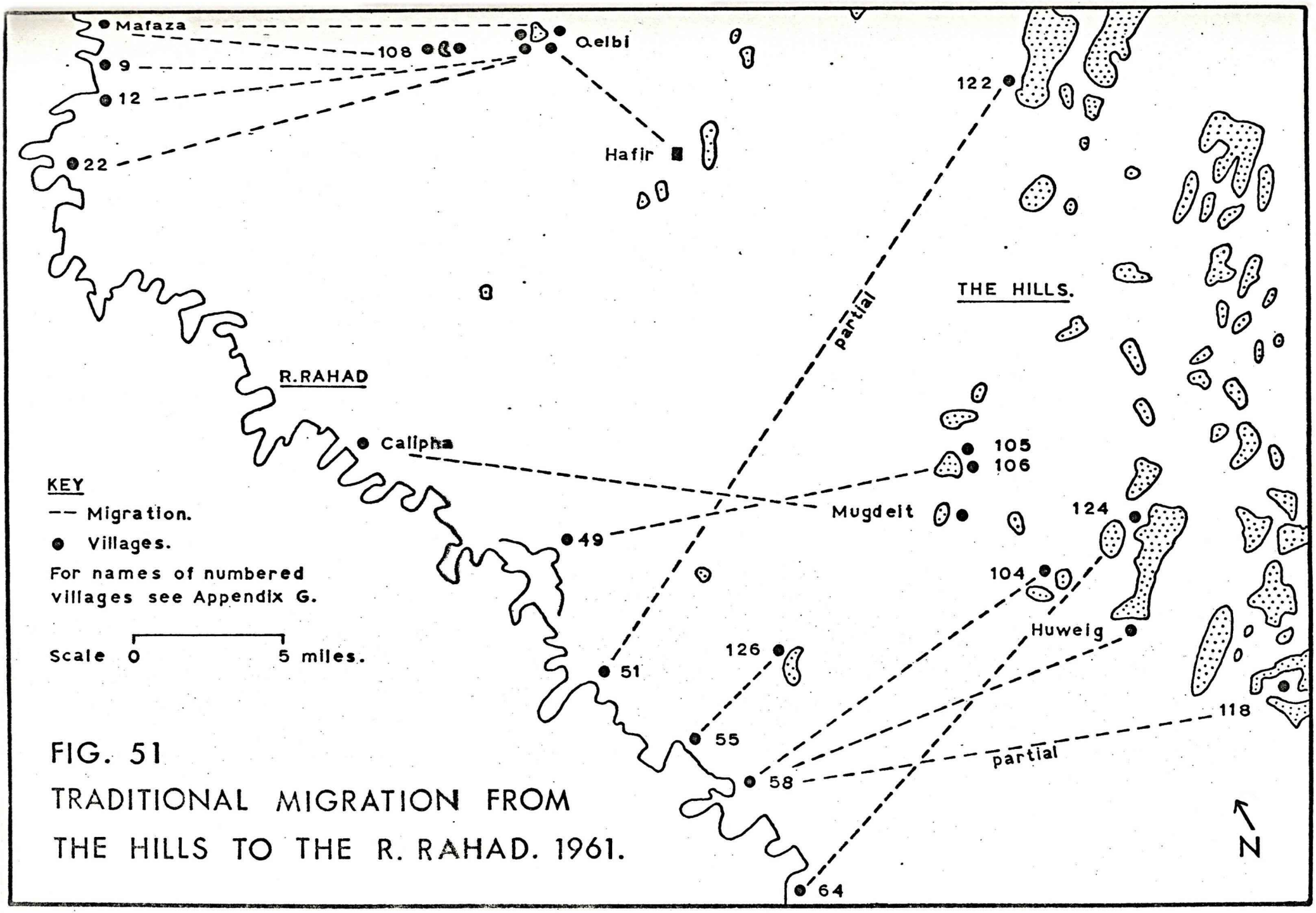


FIG. 51

TRADITIONAL MIGRATION FROM THE HILLS TO THE R. RAHAD. 1961.

year. In some the ground is completely burnt over at the end of the rains to get rid of flies and houses have to be rebuilt annually. In the larger camps there may be some permanent buildings such as corrugated iron shops to serve the needs of the transmigrant villages.

The animals of the villages are usually taken to the river as soon as hand-dug hafirs are empty, in order that the remaining well water may suffice for the population until after the harvest. When the water runs short the men may go to the camp-site to prepare the houses, and return after ten days or so to fetch their families. Though all migrate within a few days of one another, the whole village does not necessarily move together. Now that people so often move by truck many neighbours may band together to hire a vehicle. By this means the journey takes several hours, whereas in the past it often took several day trips to move a family and its possessions. Sometimes it must have been necessary to spend a night on the way. When the villagers leave, one or two families, usually those without children, remain behind to act as gaffirs (watchmen). Either during the dry season or at the first rains the men return to the Hills to clean their fields carrying water from their dry season camp if necessary. As soon as the main rains bring water everyone returns to the permanent village.

When pools form in depressions and run-off enters hand-dug hafirs the beasts are brought back, before the clay plain becomes impassable.

Several villages, such as Shush, Beila, Kartot and Qurein, have probably never been fully transhumant in the last sixty years, although some of their number have moved each year. They have no dry season camp and those that migrate tend to move to towns like Hawata and Mafaza. Thus Beila people, who before the Mahdia had a camp at Dani Kola, now just set up straw shelters or stay with friends at Mafaza if necessary.

In some instances, even where water supplies have been adequate, the whole village has not always chosen to become settled. Despite mechanized hafirs West Africans from Ban and Balos prefer to migrate because they find it economically profitable to spend the dry season fishing. Even if water supplies are enough for men they are not usually enough for cattle, and groups of Arabs may continue to accompany the beasts to the river because they have always done so. Even before 1950 some people preferred to be transhumant. The Fulani always migrated from Um Sagata, which had excellent serpentine wells and about a tenth of the population of another serpentine village used to migrate unnecessarily with their cattle.

MOVEMENTS OF STOCK.

While mechanized hafirs have enormously reduced human transhumance, the traditional pattern of movement of stock remains largely unchanged. Mechanized hafir water is not often made available to cattle and so there has been no development of local movements to obtain water from nearby villages in the dry season.

1) Home cattle.

Only four of the forty-four villages are able to water their cattle at home in the dry season. Three of these villages have only a few beasts, which they water at their mechanized hafirs, and one waters its beasts by means of a serpentine well.

In addition another four villages keep some of their cattle at home for milk and send the rest to the river. These are mostly villages in the serpentine, where water is available but where the effort of drawing it discourages keeping animals unnecessarily.

2) Transhumant cattle.

About fourteen of the villages have animals that are transhumant although the village itself is settled. These villages are generally in the granite area, where mechanized

hafirs provide just sufficient water for the human population to avoid transhumance and little is left over for animals.

Although goats usually share the same water-points as people, there are five villages where water supplies are so short and the number of goats so large that they have to be herded to the river.

Beasts usually leave with their herdsmen at about the end of January when hand-dug hafirs are dry, and stay away until there are signs that the main rains are beginning and they can drink in pools in the bush. They are thus away for at least four and a half months each year. Beasts from villages which are transhumant are either transhumant also and follow the pattern previously described or they may practise a wider form of migration like the cattle in the north part of the Ridge.

3) Butana-Rahad Circuit.

This semi-nomadic circuit is carried out by at least some cattle from 15 per cent of the villages. In the rains the beasts proceed to the Butana, where they are herded by nomadic Arabs. They return to their villages for several weeks about November and drink at hand-dug hafirs until the latter are exhausted. They are then taken by a herdsman to the river, where they remain throughout the dry season.

They return to their villages in the Hills for a few weeks at the beginning of the rains and move north before the ground is impassable.

Villages with animals making this movement are for the most part Arab, with a large tradition of animal rearing. They are almost all also villages where either all or part of their village still practise transhumance and meet their cattle at their dry season camp. This kind of movement is most developed in the north of the area, where links with the nomads are closest. The village of Qelbi in the far north is, indeed, a contact town for both settled and nomadic Rufa'a. Many of the villages are in fact recently settled and still living in tents in their compounds. To the north of the village is a small encampment where a group of nomads who have lost most of their animals have decided to cultivate for a few years before rebuilding their stock or, alternatively, opting for a settled life.

In this northern district, also, two West African and one Western Sudanese village even make arrangements for their beasts to go off with Arab herders.

NORMAL USE OF WATER-POINTS.

Where a village has several sources of water supply,

as 64 per cent of them do, the various water-points are normally used in the following order. At the beginning of the rains gallits are used. Filling after the first showers, they may be the only source of water for several weeks. During the rains people drink either at gallits or at wells if these are accessible and not dirtied with flood water. Animals will meanwhile drink at a natural pool in the bush away from cultivation. At the end of the rains gallits are soon used up or become fouled. Then wells are cleaned and people either drink at them, or, if it is easier, they may use the hand-dug hafirs that have been used by beasts since the pools dried up. About January hand-dug hafirs are empty. Cattle are usually sent to the river. People and goats drink at the nearest well or mechanized hafir. The majority of granite wells become inadequate at the beginning of February, when most people and all goats either leave for the river or become wholly dependent on mechanized hafirs. In the old days jamams were opened up when hand-dug hafirs and wells failed. They would yield well for a month and support a few people until the end of May. Now that the dry season water shortage is somewhat alleviated they are opened up earlier and used like wells.

Serpentine wells are adequate throughout the year. When hand-dug hafirs are dry, however, some of the cattle

may be sent to the river because of the effort involved in watering both beasts and men from wells of this depth.

DRY SEASON OCCUPATION.

On the whole the Hills show much less variety of dry season occupation than the Ridge. In this area of scant water supply, too much time is spent fetching water for extensive employment to be undertaken, and the most that many villagers can accomplish is the occasional clearing of fields or, if they have animals, the collection of forest produce.

61 per cent of all adult villagers, however, in the villages surveyed did have gum arabic gardens. These included Arabs, who do not seem to have lost their claim to gardens like their fellows in the Southern Council, and some recently arrived Western Sudanese. The fact that new immigrants obtain gardens indicates that there is still hashab available for allocation. The full exploitation of the trees is probably still hindered by inadequate water supplies. The gum gardens lie well away from the river and there is considerable difficulty in exploiting them if villagers are forced to operate from a dry season camp on the Rahad.

The Arabs, whose habit of transhumance makes them

unable to pursue dry season occupations in the Hills, do not make use of profitable opportunities at their camp. They do not, for the most part, fish or cultivate gardens or gerf like Western transhumants but confine themselves to the occasional gathering of sunt fruit or transporting of forest and riverain products.

The Hills have not been much influenced by Gedaref Town. ~~There is no trade in building materials, such as we find between the Ridge and Gedaref.~~ Nor has the town attracted Westerners or Arabs into wage earning employment during the dry season. In general, all groups whether settled or transhumant are severely underemployed in the dry season, with the exception of those practising the dual type of agriculture. In its lack of opportunities for employment and its lack of activity during this period the Hills are the area least affected by modern economic development.

STUDIES OF VILLAGES IN THE QALA'EN NAHL HILLS.

1) MUGDEIT[2]

Like most of the hills in the Nahl area, Jebel Mugdeit has a long history of settlement. Near to the top there is a large gallit, which is now in disuse, and fragments of pottery. House circles, nestling among boulders half-way up the slopes, testify that there was once an occupation site here.

At the foot of the hill, south of the village there are the remains of a pre-Mahdia settlement, which was three or four times as large as the present village. The people used a well, and jamams. Behind the village were round gallits, about one metre across and several metres deep, which had been excavated along a joint plane in a solid slab of granite.

The present village is pathetically small, even by the standards of the Hill area, where water supplies often restrict the size of settlements (fig.53). It consists of only forty to fifty families. As a viable settlement it suffers from its proximity to Ban, which is the headquarters

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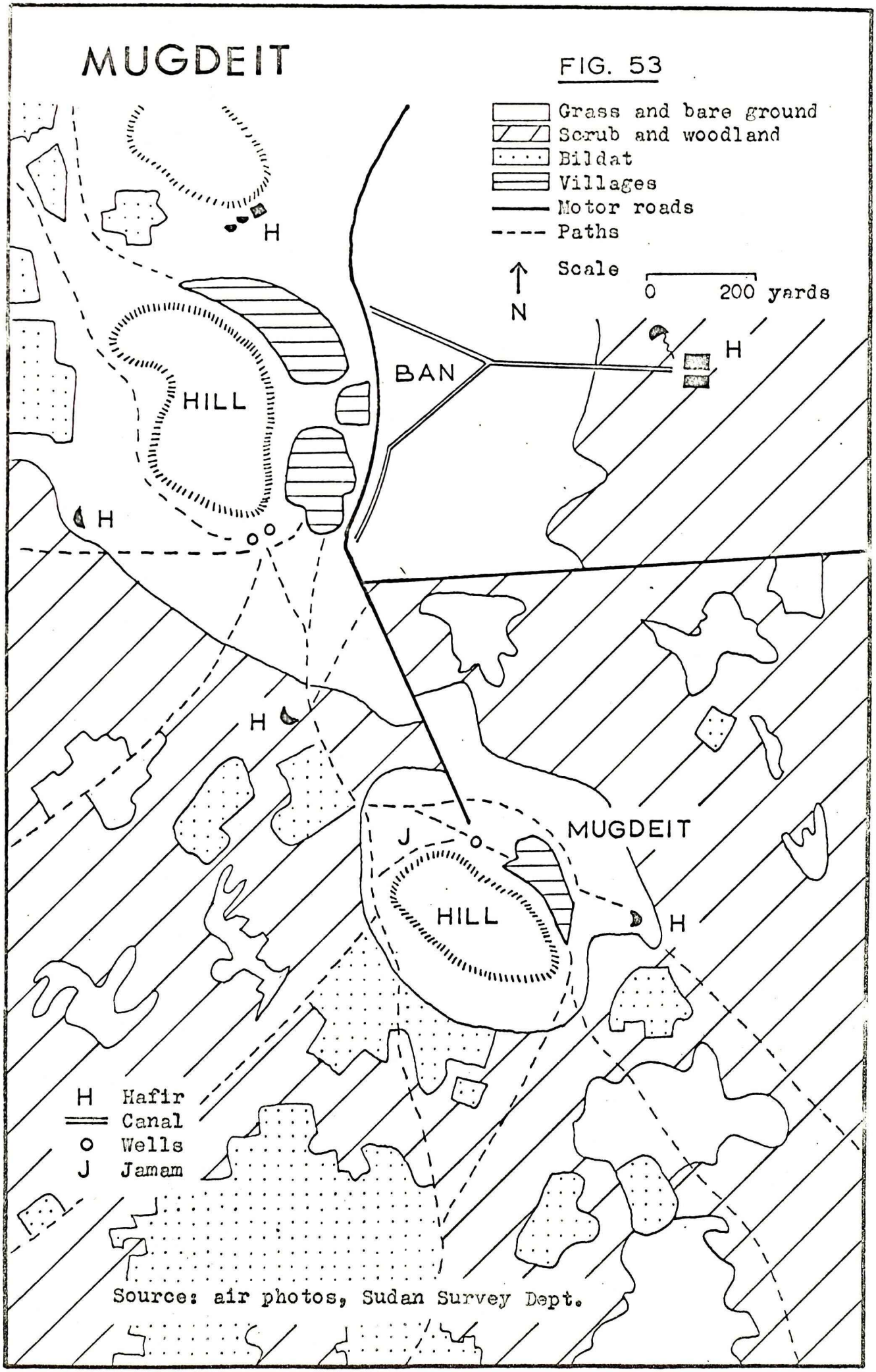
[2] (For the location of this and all other villages see Appendix G.)


MUGDEIT
FIG. 53
Grass and bare ground
Scrub and woodland
Bildat
Villages
Motor roads
Paths
Scale
0 200 yards
N
BAN
HILL
MUGDEIT
HILL
H Hafir
Canal
Wells
J Jamam
Source: air photos, Sudan Survey Dept.

of an omda[3], a market and a religious centre, as well as one of the largest and tribally most diverse villages in the Hills. With Ban less than a mile away, Mugdeit people spend much time there enjoying its facilities and obtaining their material requirements. (fig.55) Mugdeit itself, supports a single brick-built shop, which sells only the most commonly used household goods.

The village has lost many of its families, who have migrated to Calipha on the R.Rahad in the last twenty odd years. Before the building of the mechanized hafir at Ban in 1953, the people of Mugdeit practised the traditional form of transhumance. They and their animals left for the river together. The well and the hafir provided by Major Evans dried up at about the same time, just after harvest. They passed the dry season at Calipha, where in about 1930, a small Fulani community began to develop. Gradually, a few individuals began to remain at Calipha in the rains as well. The numbers of those staying swelled enormously between about 1945 and 1951 reaching a peak in 1947, when seven extra families remained in Calipha for the first time.

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3 (An omda is responsible to the local council for a group of villages. He is an official who lies between sheikhs and nazir in the traditional hierarchy of authority.)

(fig.54). Then after the building of the new hafir at Ban, water supplies at Mugdeit were so much improved that emigration slowed down to a trickle.

Mugdeit is the only Hill settlement that has formed a permanent village on the site of its dry season camp, though there are examples of individuals from Asama settling in the market centre of Wad Bakr, and of Qelbi people settling in the town of Mafaza. Certain special circumstances may have contributed to the move. In the first place Calipha is close to Hawata, and settlers may have been attracted by the facilities of the town and railway. The surrounding land had already been largely stripped of timber for fuel and building, so that it was relatively free of flies, healthy for animals and easily cultivated. The presence of West African settlers, themselves with large numbers of cattle and with a way of life very like that of the Arabs, was probably encouraging.

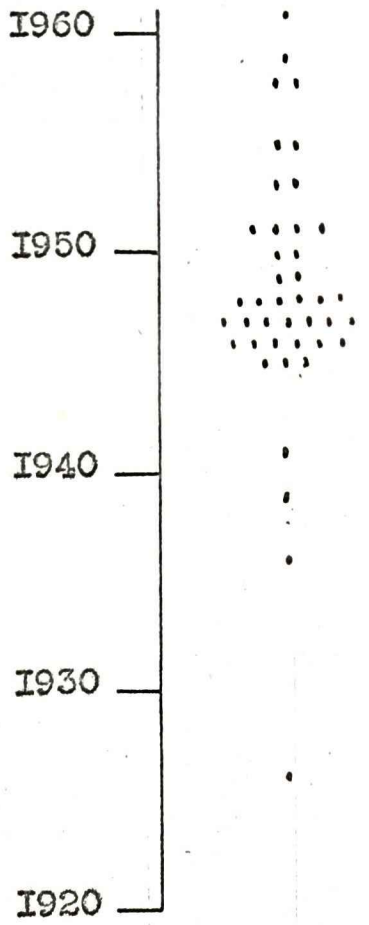
Mugdeit lies on the edge of the Nahl Hills. Its fields extend about a third of the way to the river. Further west lie its gardens. Settlers at Calipha were able, if they so wished, to cultivate their old farms, which lay about three hours away by donkey. Many were actually closer to their hashab than they had been before.

Thus, by 1961 almost exactly half the village of

FIGURE 54

MUGDEIT. EMIGRATION TO CALIPHA

Year of departure from Mugdeit



• one family

Total 42 families

fetched water from hafir Abu Hamir, seven miles away. Alternatively they paid 3 piastres[4] for four gallons to have it delivered from there. Usually it cost 2 P.T. to have it delivered from Ban. One or two families anticipating the extent of the shortage, left for the river in January or February. Over 40 per cent of the village went in March, and about quarter remained until May (fig.55). Moving was much easier for Mugdeit than for the other villages resuming transhumance. All the villagers had friends and relatives in Calipha with whom they could stay. 38 per cent of the men, who were engaged in business or commerce in the Hills, did not migrate. Eight of the householders who remained sent their families off to the river. They included the manager of the simsim oil press and two merchants with shops at Ban, one of whom moved into Ban to stay with relatives. Several wealthy men, who could afford to pay for their water, kept their families with them. These paid for water to be fetched from Abu Hamir, until eventually the government was persuaded to send a truck which brought water from the bore at Qala'en Nahl for 2 P.T. a tin. Just before the rains began, many men

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4 (There are 100 piastres (P.T.) in a Sudanese pound (L.S.) .Five P.T. equals a shilling.)

Mugdeit was permanently settled at Calipha, and from 1953-1960 the other half was able to be permanently settled in the Hills.

Mugdeit's present sources of water include a well of twelve metres' depth. It is completely useless after April and very low yielding for several months before. There is a jamam, the only one in the area still being used in the traditional manner. It is not opened up and its waters tapped until after the well has dried up. For about fifteen days it yields well, and thereafter until the beginning of the rains it provides fifteen to twenty gallons a day. After December, supplementary water supplies for human consumption are increasingly required. They are fetched first from Ban's wells. These are sited where a joint plane concentrates run-off from a very large hill, are better than Mugdeit's well and yield freely for perhaps a month longer. After this people go to the new mechanically-excavated hafir that has been established about half a mile out into the plain to obtain sufficient depth of clay. (see fig.53).

In 1961, Ban's hafir was among the many that only partially filled. The people of Mugdeit once more became transhumant, but the move was not an organized communal affair as in the past. At first few went. The people

returned to Mugdeit for a few days to clean their fields. They, too, were forced to buy water. When the rains were such that wells began to rise, their families returned over the space of about a week. Usually several families banded together to hire a truck for themselves and their belongings.

FIGURE 55.

MUGDEIT'S MIGRATION TO CALIPHA IN 1961.

Month	Number of families migrating during that month
January	1
February	4
March	18
April	11
Families remaining at Mugdeit	7
Unknown	1
Total:	42

Mugdeit contains a mixture of tribes which is typical of villages in the Hills (fig.56). The village was originally Rufa'a. About fifty years ago they were joined by a Ja*alin group from the Gedaref area, and these have now come to form over half the population. Over 20 per cent is made up of an assortment of Western Sudanese, not more than two from any one tribe. There is a Ricabin and a

Shukriya who is married to a local girl. Residence in Gedaref is usually matrilocal. The village is not divided into tribal quarters. As in many Hill villages people live where they please. There is one sheikh, a Rufa'a, a member of the oldest, although not the largest tribe in the village. All the villagers, except the Shukriya and one of the Western Sudanese, were born in Mugdeit, showing how stable this strange tribal combination apparently is.

FIGURE 56.

MUGDEIT. POPULATION BY TRIBE.

Tribe.	Number of adult male householders of that tribe
Ja'alin	22
Rufa'a	9
Ricabin	1
Shukriya	1
Western Sudanese (various tribes)	9
Total:	42

The village is not prepossessing in appearance. It looked particularly poor in 1961, when the houses were in bad condition. Lack of water had meant that mud walls could not be replastered. Many families had been forced to migrate before they had had time to repair their thatch. By far the largest and most ostentatious building in the village was a corrugated-iron shed used to garage a truck

in the rains.

The general appearance of poverty receives confirmation from the small-scale of village agriculture. The furthest fields lie only one and a half hours away on a donkey. Most families cultivate so close to the village that the men come home for lunch. This suggests a considerable degree of overcultivation and soil exhaustion close to the hill. Only twelve out of a limited sample of thirty farmers said that they employed labour. The most common number of employees was six, but these included men picking gum as well as those doing agricultural work. The village has some harig, a type of land that is now found in Gedaref only in the underutilized Hill area, in places where water shortage restricts population.

85 per cent of the villagers have gum gardens. They include Arabs who have retained their traditional rights to gum and Western Sudanese immigrants, who naturally obtained holdings fairly easily from the Western Sudanese nazir of Qala'en Nahl Rural Council. Those without hashab includes the Shukriya, and two who were too old to want gum gardens. Two of those without gardens worked on gardens belonging to others.

About a third of the villagers only pick gum and over a quarter do nothing at all in the dry season (fig.57).

Old-established Arab villages usually show a considerable degree of underemployment, but in Mugdeit the situation is accentuated by the water shortage. While there is water in the well at Mudgeit or in the wells on the edge of Ban, women can fetch it. Only men, however, get water from the mechanized hafir - the journey is too long for women and would involve their being seen walking through Ban village. Thus, many men spend several hours a day fetching water so that opportunities for profitable employment are restricted.

FIGURE 57.

MUGDEIT. DRY SEASON OCCUPATIONS.

Occupation.	Number of men engaged in it.
Gum picking	14
Shop keepers	5
Transport (camel)	5
Simsim factory	1
Water carrier	1
Builder	1
Gardener	1
Gerf cultivation	1
Unemployed	12
Total:	42

There is not, in any case, a wide variety of dry-season occupations available in the Hills. Mugdeit, however, is helped by its links with Calipha and by the proximity of Ban. One man herds Calipha's cattle, another has gerf there, and a third, married to a Hawata girl, has

an irrigated garden. The more enterprising have gone into commerce, transporting grain and simsim to and from Ban's produce market, running a simsim oil factory and managing a quarter of the twelve or so shops in Ban's market. Part of the village has shown itself remarkably adaptive to modern life. A high proportion of children, including girls, go to school in Ban. The village boasts the first university student from the Hills. Three of the farmers have been to Mecca, a figure very high for the Arabs of the area, who were not accustomed to make the pilgrimage in the past.

A few years ago the village lost its cattle through disease. The people have never rebuilt their herds. The rich preferred commercial outlets for their capital, and the poor were unable to raise the money. The village has a very large number of goats instead. These drink at Major Evans' hafir until it dries out in late January. Most of the herd then becomes transhumant and goes to Calipha. Families may retain one or two milk animals, which they water by hand in the house.

Communications are quite good. A truck collects passengers from six villages in the Hills, and goes daily to the market and railhead in Hawata. The fare is 10 P.T. each way. It is perhaps, significant of the economy of the

area that the only regular transport goes, not to Qala'en Nahl, the capital of the Hills and administrative centre of the rural council, but to the developing riverain area. Both now and in the past, when it provided dry season water supplies, the Rahad has been closely linked to the Hills.

2) QELBI

Qelbi is the most northern of the Hill villages which were regularly transhumant until after the Second World War. It is at the foot of a small hill, and as it has no well or jamams, it has always been entirely dependent on hafirs and gallits for its water supply.

The gallits, which are extremely numerous, are surrounded by a remarkable variety of archeological evidence of their former use. There is an abundance of pottery, grinding stones, gaming boards and knappflocher and possibly stone terracing and house-circles.

The present village is not, however, very old. This is not surprising, as its water supplies are too inadequate for it to have been chosen as one of the first sites for permanent settlement. Situated on the southern edge of Butana, it is said to have been settled by Rufa'a nomads, who began to cultivate here in the rains a short time before the Mahdia. The village still attracts nomadic tribesmen. Even in the main village some of those who have been settled for at least several years are reluctant to abandon their traditional way of life, and continue to live in tents surrounded by a normal compound wall. On the edge of town, beside the least-used of the old hand-dug hafirs, there is a

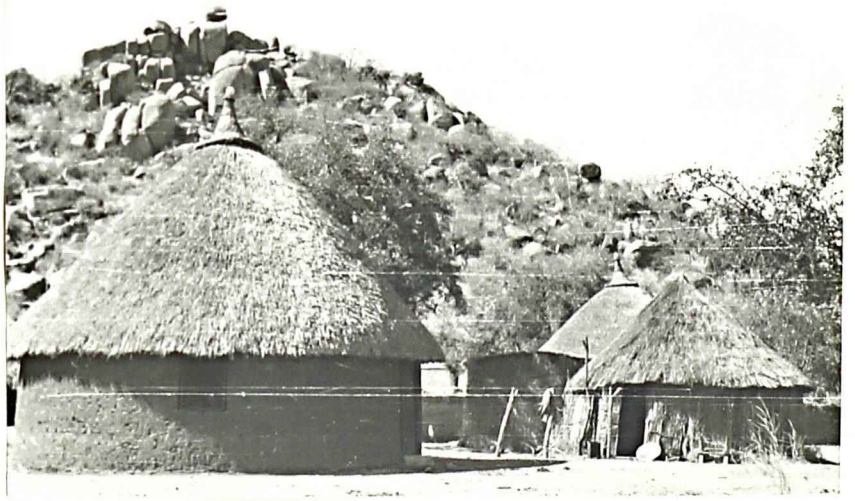
small permanent camp (fig.58). It consists of Rufa'a nomads who lost most of their animals a few years ago, and are forced to cultivate here for several years, until they can rebuild their herds. They then intend to resume their nomadism. In similar cases, however, groups have usually eventually decided to remain settled.

Animals still assume enormous importance in the lives of the people. Within the main village there is a large bare area where the villages keep their cattle close to them at night. While milk animals now remain with the villagers throughout the year, the bulk of the animals from the larger herds are nomadic. They pass the rains in Butana, and return to Qelbi to drink in the hand-dug hafirs for a mere ten days or so before proceeding to the Rahad. The animals remain in the riverain area throughout the dry season. When the first rains fall they move to Butana again, pausing briefly at Qelbi on the way. This migration is essentially traditional in character. In the rains Qelbi is fly-free and surrounded by good grazing so that there is no economic necessity for stock to go north to Butana. Since these animals are so seldom available at the village it is clear that they are kept as a source of prestige and investment rather than for utilitarian purposes, as providers of meat or milk.

The present village is very large and includes a con-

FIGURE 58 QELBI. A VILLAGE IN THE NAHL HILLS.

General view of the village from the hill
ARAB HOUSING



Settled villagers. Note daub construction of walls

Nomads living in tents

siderable number of Western Sudanese. Some have settled in the southern part of the main village. Others form a separate community on the other side of the hill. They established themselves as close as possible to the new mechanized hafir. The older Western Sudanese settlers have also acquired cattle, showing that there is no decline in interest in stock at Qelbi. They send them to Butana with Rufa'a herdsmen. They made contact with suitable nomadic groups through the settled Rufa'a of the village.

The village had always been transhumant, for gallits and hand-dug hafirs have never constituted permanent sources of water supply. As the population of the early village grew, however, these water supplies became increasingly inadequate. Qelbi was one of the communities receiving new hafirs from Major Evans in the 1930s. He built two hafirs here to help the villagers to remain in the Hills until after their fields had been harvested.

Traditionally, the people of Qelbi had moved to a single dry season camp at Dabaloba. The move was well organized, the people following their beasts soon after harvest. As numbers increased a better use of grazing and water was obtained by a smaller group going to Um Suidibra. A few individuals would settle on the outskirts of Mafaza to receive the benefit of town facilities, although the surrounding area was badly over-grazed. These included the

shop keepers from Qelbi, who moved their entire stock and opened stores in Mafaza during the dry season. The bulk of the people, however, continued to go to Dabaloba. The schoolmasters moved there and reopened the school in a large temporary straw shelter. (see Figure 58).

In 1953 Qelbi received a mechanized hafir and the need for transhumance ceased. Many new Western Sudanese came to the village attracted by the improved water supplies. Then in 1961 the hafir failed to fill. The situation was not helped by the fact that since the new hafir had been built, no one had bothered to maintain the old hand-dug ones. They had all silted up so much that they held water only in the rains. After the shock, the council authorities desilted and repaired one of Major Evans's hafirs, so that the next year it once more held water until December.

Transhumance had to be resumed. Part of the village returned to its camp at Um Suidibra. The majority who used to go to Dabaloba were unable to do so, for nomads were using the grazing. Instead they settled at Hassan, a West African village with two animals and with water to spare. Some had always kept up houses at Mafaza. Now they were joined by many others, who set up rough straw shelters on the edge of town. Others refused to leave the hill area. With their cattle they squatted by the mechanized hafir at

Arid, which still held water. A transhumant movement, which was once regular and orderly, had become chaotic when it had to be resumed after a space of years.

3) HUWEIG.

Huweig is an example of one of the newer Western Sudanese villages in the Hills. Unlike the older, larger settlements, these villages usually consist of only one or two tribes. The people of Huweig are all Bourgu. It was founded only six years ago and half the villagers came direct from Darfur. An additional six families came from Kordofan. There are now about thirty-five households. The village provides a good example of how people are leaving the remoter provinces of the west to seek better opportunities in the eastern Sudan. Yet despite the large number of recent immigrants to the village Huweig has a balanced population structure. Most of the Western Sudanese travelled with their families. Over two-thirds of the households contained an elderly dependent relative as well as husband, wife and children. In its family size Huweig is very unlike most new hafir villages. (see Chapter IV). Considering its age, this village generally shows remarkably stable characteristics. Only four families are too poor to employ field labour. There are, as yet, no very rich men, everyone employing only two or three agricultural workers. Of the twenty families who have already acquired hashab, three are beginning to employ gum pickers.

The village's site was undoubtedly chosen because of the untapped areas of gum and ample land around it. Recent settlements in the Nahl Hills have nearly all been established with agricultural considerations uppermost. Many, like Huweig, have been established at the foot of hills too small to serve as adequate catchments. Permanent settlement has been possible only because there is a mechahized hafir which provides all-year supplies in the neighbourhood. Bea's hafir is only five miles away. When it failed in 1961, 60 per cent of Huweig became transhumant. Without a dry season camp themselves, they joined the nearby village of Balos, which had kept up its dry season quarters by the River, even though most of the villagers no longer migrated.

Huweig actually occupies the site of an earlier village which was abandoned about twenty years ago for lack of water. The village has the marks of two jamam sites and there is a badly silted hand-dug hafir left by the former occupants. This hafir serves men and goats in the rains. Because the village is new, and water is short, it has not acquired cattle. The goats, however, have to spend most of the year away from the village. They camp first at Bea's hafir and then move to the Rahad.

Throughout the dry season drinking water is fetched from

Balos' wells three miles away and later from Bea's hafir, which is a further two miles off. The men of Huweig are not normally transhumant. Two-thirds of them have acquired gum gardens near the village and over half obtain casual employment locally by clearing fields for other farmers. They are therefore anxious to stay in the area during the dry season. As the village is new, however, only half the population has acquired transport animals for fetching water. The rest of the villagers have to carry it themselves on their heads, four gallons at a time. In eighteen cases two or more journeys have to be made daily to a water-point three miles away. By mid-December the wells at Balos are becoming crowded and time is wasted waiting to draw water. The men of Huweig find fetching water for their dependents increasingly wearisome. They are anxious to find time to undertake their dry season occupations.

The people of Huweig have therefore built houses for their families in the large village of Balos. Between mid-December and mid-January women and younger children are settled into their dry season quarters. (A few men always refuse to fetch water for their families. They instal them in Balos as soon as Huweig's hand-dug hafir dries in November, but they are exceptions.) In 1962, by mid-January the population of Huweig had fallen from 172 to 85, only men and the older boys remaining.

The men continue to live and work at Huweig, keeping touch with their families at Balos when they come to draw water. Their families are generally well off at Balos, for it is only four miles from the market and service centre of Ban. Huweig is much more isolated. As the dry season progresses, the crowds drawing water at Balos increase, and the water becomes rather salty. While their families continue to drink at these wells, the men of Huweig increasingly have to undertake the longer journey to fetch water from Bea's hafir. Without the development of mechanized hafirs, like that at Bea, it is very doubtful whether new Western Sudanese villages, such as Huweig, would have been founded in the Nahl Hills.

CHAPTER VI.

THE RIVER RAHAD.

HISTORICAL SUMMARY.

The River Rahad provides the most reliable source of permanent water in the area studied. For at least several centuries it has attracted a relatively dense population, particularly in the dry season. Before the Mahdia its waters were extensively used by both agriculturalists and nomads.

Four different groups of herdsmen used the river in the dry season. Cuahla and Rufaa nomads moved south from the arid Butana. Part of the Dubanya moved from the Ridge to graze the southern part of the area. The transhumant Arabs of the Hills moved annually to their riverain camps, which were for the most part where they are today. Finally there was a movement of Dinka northwards at least as far as Abd El Latif in the rainy season. These Dinka had well established camps, the sites of which can still be recognized today. Their herds grazed the same ground as that used by the more southernly Hill communities in the dry season. Relations between these racially very different

nomadic groups seem to have been amicable, for some Dinka settled in Hill villages (see Chapter V).

Arabs, mainly Cuahla and some Hammada, had extensive permanent settlements. Most of their village sites were over two miles away from the river itself. They thus avoided the mosquitoes and other insects that inhabited the flooded and heavily forested riverain strip. (In the rains, particularly in the south, many of the villages may have contained only slaves, who were responsible for cultivation. The Arabs and their herds probably spent the wettest month in the more northern, healthier environment of Butana).

POST MAHDIA HISTORY OF SETTLEMENT AND TRIBAL DISTRIBUTION.

During the Mahdia the whole area seems to have been depopulated. Many Arabs fled to the Blue Nile or the Dinder.

After the war only ten of the villages existing before the Mahdia were reoccupied by the remnants of the original Arab population. The founding of new settlements along the Rahad proceeded very much more slowly than in the other two regions (fig.59), no doubt partly because neither Arabs nor Western Sudanese found the regions particularly attractive compared with the Hills or the Ridge. Less than 15 per cent of the present villages

FIGURE 59.

THE RIVER RAHAD. AGE OF VILLAGES.

Period	Number of villages formed during this period and existing in 1961.
Pre Mahdia	10
1884-1910	22
1911-1920	06
1921-1930	7
1931-1940	12
1941-1950	12
1951-1960	7
	56

FIGURE 60.

THE RIVER RAHAD. GROUP COMPOSITION OF VILLAGES

Group	Number of villages containing:-
Arabs only	6
Western Sudanese only	4
West Africans only	36
Arabs and Western Sudanese	1
Arabs and West Africans	5
Western Sudanese and West Africans	2
Arabs, Western Sudanese and West Africans	2
Total:	56

were founded between 1900 and 1920, but the development of the railway and consequent influx of pilgrims enormously stimulated the opening up of the area.

The River Rahad is essentially an area of West African colonization. Elsewhere in the District Western Sudanese have formed the dominant immigrant group (except in the Northern part of the Ridge, where immigrants of all nationalities are few). Along the river West Africans are found in over 80 per cent of all villages (see fig.60). They form the majority of the population, both on the east bank, which is administered by the Western Sudanese nazir of Qala'En Nahl, and on the west bank, which is part of the Arab administered Gedaref North Rural Council.

After the Mahdia there was some Western Sudanese settlement along the Rahad, but it was considerably less than in the other two regions. In the immediate post-war years they seem to have preferred to be closer to the Western Sudanese administrative centre rather than risk friction with local Arabs by living on the border. Thus Western Sudanese were never found in more than ten villages. As West African settlement increased, therefore, the Western Sudanese came to form an insignificant proportion of the total riverain population. It seems, too, that their absolute numbers may have declined. According to

government reports of the 1920's and the 1930's they were reduced by sickness and were failing to maintain their numbers by reproduction. Perhaps because the Western Sudanese feared the unhealthiness of the river banks, they established many of their villages away from the Rahad as the early Arab settlers had done. Having chosen to be far from their water supplies and failing to make use of the opportunities for dry season occupation provided by the river, there was little to keep them in the area. In the last ten years three Western Sudanese villages have been abandoned. Nearly all their people went to Qala'En Nahl, where the provision of a pumped water supply tipped the balance in favour of the healthier hill environment.

West Africans claim that there were a few West African pilgrims settled near Mafaza before the Mahdia. As Mafaza lay on the southern route between Sennar, the Red Sea and Mecca this seems perfectly possible,

The earliest post-Mahdia West African settlement is a Fulani one, founded forty-eight years ago. Closely related to the Fulani groups on the Blue Nile at Maiurno and the Atbara group centred on Hillat Hukuma, their forbears left Nigeria at the turn of the century as refugees after the

British had overthrown the Fulani Emirate.

Although these Fulani migrated for political reasons, the vast majority of West African settlers along the Rahad are pilgrims, travelling for religious reasons. The Rahad is a particularly suitable place for these pilgrims to earn money. It offers more variety of economic opportunities for West Africans than the other regions of Gedaref. Underpopulated by other groups it offers ample land suitable for bildat cultivation. In the dry season the east of obtaining water from the river enables pilgrims to devote their full time to profitable occupation. The flooded gerf lands along the river enable specialised cash crops to be grown at the beginning of the dry season. Dried fish are an important export from the area. Since the establishment of the Mechanical Crop Production Schemes the dried fish industry has boomed, for harvesters demand it as part of their daily rations. As the riverain area has increased in importance, more casual labouring jobs have become available at its market railhead, Hawata.

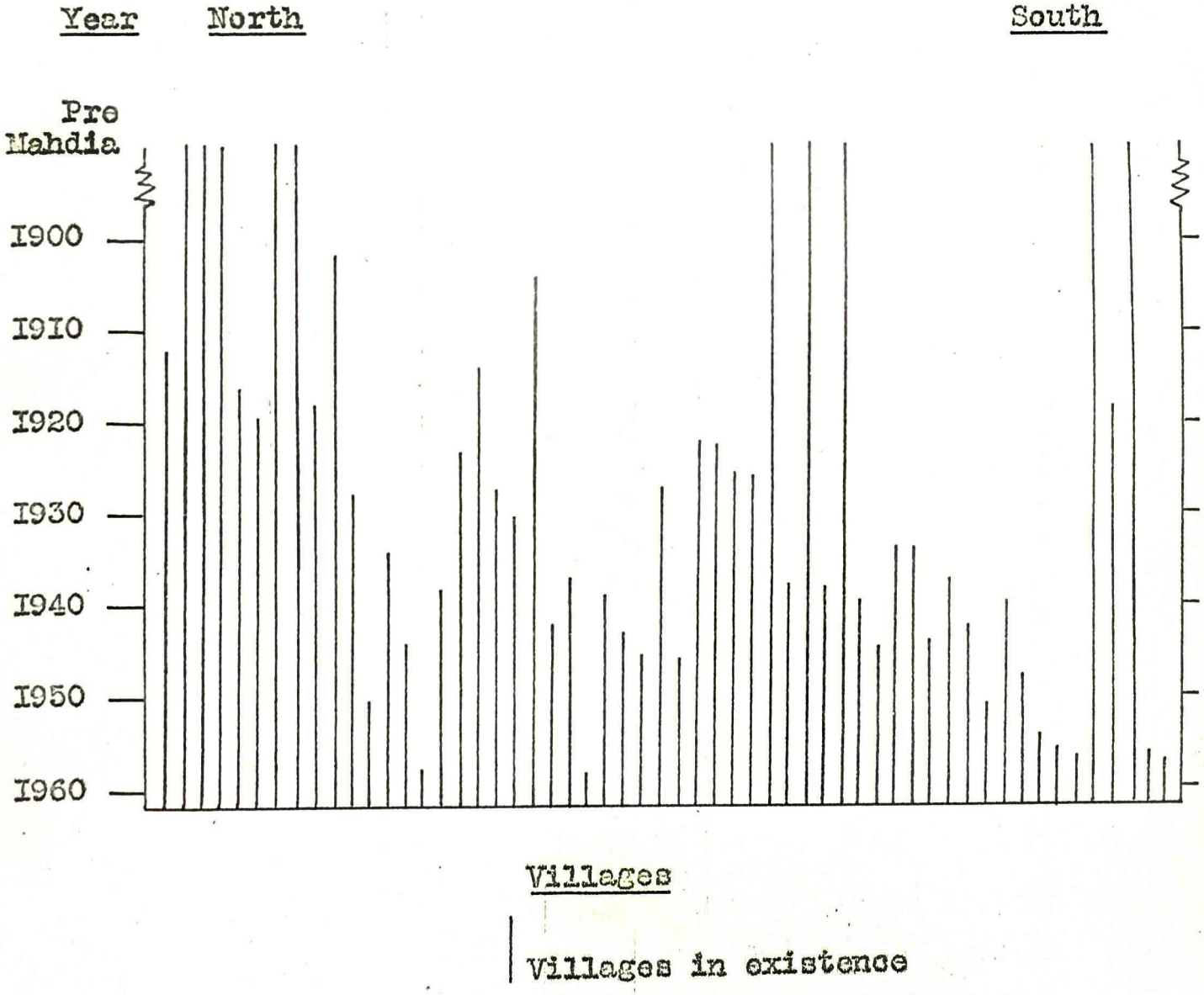
AGE PATTERN OF SETTLEMENT.

When the Arab remnent returned to the River, after Mahdia they formed scattered settlements throughout the area, but their main concentration of population was in the

north around Mafaza. It was to the north, too, that most of the early immigrants were attracted. This was partly because the main east-west route crossed the Rahad at Mafaza, and partly because the north was a more attractive area for settlement. The riverain strip here was not so flooded nor so densely vegetated and unhealthy as in the south and the open grassland beyond was easily cleared for bildat.

The northern area was soon densely populated and the pressure of population on land, particularly on the very limited gerf land, was reflected in lower yields. As early as 1925 West Africans began emigrating from the Mafaza area to places further south on the river. These movements were not movements of entire villages but rather the emigration of groups of young male pioneers. The sheikhs of Sillah, Bello, Qasim and Hausa Calipha all originally came from villages near Mafaza. Complaints about overcultivation are now coming from villages as far south as Calipha, and pioneers are still moving upstream to obtain new land. Thus, as figure 61 shows, the age of villages decreases markedly from North to South, villages in the North being over forty years old and many in the South being less than ten. The trend towards more southern settlement was intensified after the coming of the

FIGURE 61 R. RAHAD. AGE OF VILLAGES FROM NORTH TO SOUTH



railway in 1926. It crosses the central part of the area which it opened up for settlement. The far south remained extremely unhealthy in the rains and only the most hardy pioneers settled there. In the mid-1950's gamoxene was introduced and annual spraying has reduced the number of sand flies and mosquitoes that cause kalazar and malaria. Though the area is still unpleasant in the rains, settlement here is now more practicable. Some richer Arabs in the south, however, still send their women and children to the healthier Butana for several months.

Figure 60, however, also shows another trend in the age distribution of settlements. It seems that when a new village is established settlers prefer to be close to existing settlements, rather than to live in isolation. The earliest West African settlements are thus all close to pre-Mahdia Arab villages. Within the pattern of a general decrease in age of villages from North to South the following points can be observed. All the pre-Mahdia villages, even in the far south, had attracted West African settlements to them by 1937. Furthermore, if one considers the area between two pre-Mahdia villages, the youngest settlement is usually the one lying midway between them.

WATER SUPPLY AND LOCATION OF SETTLEMENT.

The River Rahad, like the Dinder and the Atbara, is seasonal. It flows for six months of the year in this area and thereafter there is only a strong of pools along its course. These pools occur in approximately the same places year after year as the bed of the river is fairly stable. As the dry season progresses, evaporation and percolation reduce the size of the pools, the smaller ones drying up completely.

Ideally a village requires two pools, one for human use and one for its animals. Many Rahad pools are, however, unsuitable for watering beasts, as the surrounding banks are too steep for the stock to climb. Thus large, accessible pools may not be available close to the village site. Beasts may have to be watered at pools one or two miles away in the dry season. Sometimes the only suitable pool for watering stock is the village's own pool. In this case the animals will drink direct from the water whereas the people will dig pits in the sand close to the pool. The water from the pits is filtered by percolation and is cleaner than pool water. West Africans are not always very hygienic - if the pool is large beasts may drink from one end and people from the other.

Although a village is normally located by a pool which

is large enough to last throughout the dry season, minor changes in the river bed or an increase in the size of the village may mean that sub-surface water has to be used for several months. In the north, where evaporation is more intense, pools dry up more readily. Here attempts are sometimes made to increase the capacity of pools by damming their downstream ends with earth or sandbags to a height of one or two metres. When a pool has dried up sub-surface supplies are found a few feet beneath the flat bed of the river and can be tapped by scooping out a pit in the sand. In some villages families scoop out their own pits daily. Other villages may have a few pits only but they will be lined with sticks to prevent caving in.

It is usual for villages to be built to within a few yards of the river bank. Indeed there are only six villages more than a quarter of a mile from the river. Although in the past Arabs may have shunned the riverain strip, today settlers are anxious to be as close to their water supply as possible. Three village sites have been abandoned in the last ten years mainly because they were two miles from their dry season pool in the Rahad. (Their rainy season water supply had come from a nearby khor). A fourth village, at present a mile from the river, is

contemplating moving closer to it.

The levees of the river bank are more suitable for settlement than the surrounding clays, which lie further from the river. Unlike the clays their sandy surface remains firm in the rains. Villagers can move freely within their villages. They can travel to neighbouring settlements if they are prepared to follow the tedious meanderings of the levee. In many places when the river is at its height the land immediately behind the levee is flooded while the levee settlements remain well drained and above the water level.

Since 1937 a dry season motor road has run parallel to the river. It links the market towns of Mafaza, Hawata and Wad Bakr and is normally a distance of up to six miles away from the river. Despite commercial prospects the road has attracted fewer than half a dozen new settlements. As it runs across the clays there is no well water available along it.

MOVEMENT OF VILLAGERS AND VILLAGES.

While the main movements of people have been southwards to obtain more land or towards the river to obtain easier water supplies, other factors have influenced the settlement pattern on a smaller scale. The cultivation of dura close

to the river in the south is hindered by flocks of birds which roost in the thick woods of the riverain strip and devour the unripe grain.

Several villages of Western Sudanese immigrants, who were briefly settled by the river, have become transhumant. They have established rainy season camps in the southern Nahl Hills where they can grow dura away from birds. This transhumance means that their dry season villages can be in places where there is ample gerf but where extensive flooding in the rains prohibits permanent settlement.

In the south flooding is particularly widespread. Several ill-sited villages have had to move to drier sites further from the Rahad after being flooded out during years of exceptionally heavy river-flow.

SHAPE AND TRIBAL DISTRIBUTION OF VILLAGES.

Situated for the most part along the banks of the river, villages tend to be elongated in shape, curving if necessary with the meanderings of the river. The effect of this elongation is that when a village consists of several tribal groups they will have less to do with one another than in a village where tribal quarters surround

a central water-point.

Except in the case of market centres, such as Hawata, Mafaza and Wad Bakr, a much lower proportion of the villages consists of several groups than among those in the Ridge and the Hill areas. (see figs.60 and 48 and 92). Relatively few Western Sudanese and Arabs wish to make permanent settlements in the area anyway. Moreover, with the tight meandering of the river there is physically ample room for every group of settlers to have its own water-point.

The tribal mixing which does occur conforms to the tendencies noted elsewhere. Both Arabs and West Africans prefer to mix with each other rather than with Western Sudanese. Three Arab groups have chosen to settle as minorities in existing Hausa villages and be ruled by them. All but two of the Western Sudanese villages are typically of very mixed tribal origin.

Among West Africans the Hausa form the dominant group and are found in three-quarters of all West African villages. Except in one case they form the majority of settlers, and hold the sheikhship of the village. Eleven of the villages contain minority groups of Fulani, who appear content to live under the authority of Hausa, although in Nigeria they are accustomed to form the ruling class. Except in appearance,

which is often distinctive, the few Fulani families found in these Nigerian villages seem to be almost completely absorbed into the Hausa communities with whom they are linked by a common country of origin. The only other large West African tribe are the Bornu, who occur in twelve villages (the Fulani occur in sixteen). Some are found as minority groups in Hausa villages. Many Bornu, however, are pioneers, and while the other two West African tribes are fairly well distributed throughout the area Bornu tend to concentrate in the virgin lands of the south, forming their own villages.

Only four of the fourteen permanent Arab settlements are solely Arab. In most of the others Arabs form only minority groups. They do not fish or cultivate gerf. They can find better bildat and hashab away from the Rahad. For them the attraction of the river is solely that it provides water for man and beast. In the rains there are Arabs in only 27 per cent of the riverain settlements, but in the dry season, when water supplies elsewhere are short, they are found in 55 per cent of all dry season settlements. 42 per cent of all dry season communities are exclusively Arab. Except in two cases the transhumant Arabs from the Hills do not join existing villages but form their own distinct and separate camps. In the same way the nomadic

groups, of which there were at least twenty-five in the area studied, tend to camp in areas of wood and unused scrub away from permanent settlements.

Relationships between the tribal groups are thus more distant than in other parts of the area. This lack of contact is not merely the result of fewer mixed villages but is also a consequence of greater differences in ways of life than exist elsewhere. The growing of rain fed dura and simsim is the main common denominator that binds together all the people of the area studied, but it is of least importance along the riverain strip, where the dry season occupations of fishing, market gardening or herding assume greater proportions. It is precisely in these dry season occupations that tribal differences are greatest.

Here as elsewhere the possession of hashab is generally confined to Arabs and older Western Sudanese settlers. Here, too, there is a tendency for West Africans to seek dry season employment as labourers in urban areas. Perhaps because of the proximity of the area to Wad Medani a greater proportion of its West Africans go cotton picking than happens elsewhere in the District.

The main difference between this area and others is in the opportunity for vegetable growing and fishing, occupations which are virtually confined to West Africans.

Gerf land for growing vegetables occurs where the river floods its banks. It is therefore more extensive in the south, where flooding is widespread. Near Mafaza there is little gerf,. Only two or three people in each village have it. The area of gerf increases southward so that in the far south there is enough for everyone, although it must be admitted that population in this area is less dense than in the north.

Good gerf is usually found on the convex sides of meanders. The concave side is less liable to flooding and does not receive fresh deposits of silt. It is best where the river has built up a slight levee, for here the flood water is prevented from running back into the river as water recedes. Narrow strips of gerf are found where the silt banks of the river have fractured and form a series of sheer terraces.

Gerf land is allocated by the administrative authorities. Rent is paid according to the frontage on the river. The distance flooded will vary from year to year and from place to place. Gedaref North Rural Council charges 1 L.S. for a 50 metre strip of waterfront on the west bank. On the east, Qala'en Nahl Rural Council asks for a rent of 5 L.S. for a strip of 300-400 metres bordering the river. Most West Africans can pay these charges, especially in the north,

where scarcity of gerf results in the sub-division of holdings and consequently of rents.

Seed beds are prepared before the beginning of the rains. The seedlings are watered daily by hand, and are protected from sun and trampling by straw covers. When the floods retreat they are about three months old and ready for transplanting. The crops planted vary according to the amount of flooding. Usually pepper and tomatoes are grown nearest the river. Next come beans and vegetables, with maize on the least flooded land. As the river level falls, the river banks may be planted with a fodder crop.

Maize is widely grown. It is a popular cereal with many West Africans. Several villages grow no other grain. Unlike dura it is not eaten by birds and is therefore widely found in the south where birds are a particular menace. There is almost no market for it, however, Arabs will not eat it because of the effort involved in de-cobbing.

Tomatoes form one of the two main gerf cash crops. Unfortunately the local market is now glutted. Several years ago a tin of about 20 lbs. fetched up to 25 P.T. Now, even early in the season, it fetches only 10 P.T. and during the peak period only 5 or 6 P.T. The absence of fast transport means that produce cannot easily be marketed

elsewhere. Some tomatoes are now sun-dried, to avoid low prices during the harvest period. They are sold later as a condiment.

Pepper is more profitable but less easily grown. It bears from October to March. At the peak of the season 100 lbs. will fetch 5 L.S.-6 L.S., but it stores well and in the off-season a similar quantity will fetch 11 L.S. If water supply is regular bushes survive three or four years. Unfortunately pepper is very susceptible both to water-logging and to drought. Unlike tomatoes and maize, however, it is not eaten by monkeys. In the far south where forests abound with these pests one village grows only pepper on its extensive gerf, employing labour from Hawata and Gedaref to pick it. Generally gerf cultivation is a small family affair.

There is some variation from village to village in the crops grown. Remote villages, such as Senegal, grow a wide range of vegetables and maize for home consumption. Calipha gerf owners are more sophisticated. Close to Hawata, they concentrate on one main commercial crop, with only a few plants for family use. In the north, the uncertainty of the flood and poor supporting role of the rains means that fewer crops can be grown. At Ruwina, most gardens had only tomatoes and maize with perhaps dividing

hedges of henna or lentils (fig.62).

Although gerf is mainly owned by West Africans, Arabs own irrigated gardens. There are only about a dozen irrigated gardens, averaging an acre each in the area studied. There are relatively few sites along the Rahad where pools are available for irrigation. The needs of villagers and stock have to be met first.

Because of the caving of the banks saqia cannot be used and pumps are a necessity. These require capital and a license to operate. By law all watering has to cease by May 1st each year. Garden owners are wealthy, often government officials or urban merchants. They employ gardeners, who normally come from areas where the population is skilled in irrigation, such as Egypt, northern Sudan or the Gash.

Most gardens are short of water in the dry season. For example, a garden at Um Suidibra, with an area of one and a half feddans, had the vegetable section wholly fallow by March 1961, as the pool contained only enough water for the fruit trees. Cattle from Um Suidibra had been accustomed to use this pool, but since the garden was enlarged three years ago, the pool has dried each year. The cattle now have to walk two miles to water in the latter

FIGURE 62 PLANS OF GERF

I)Holding at Hillat Senegal in the south

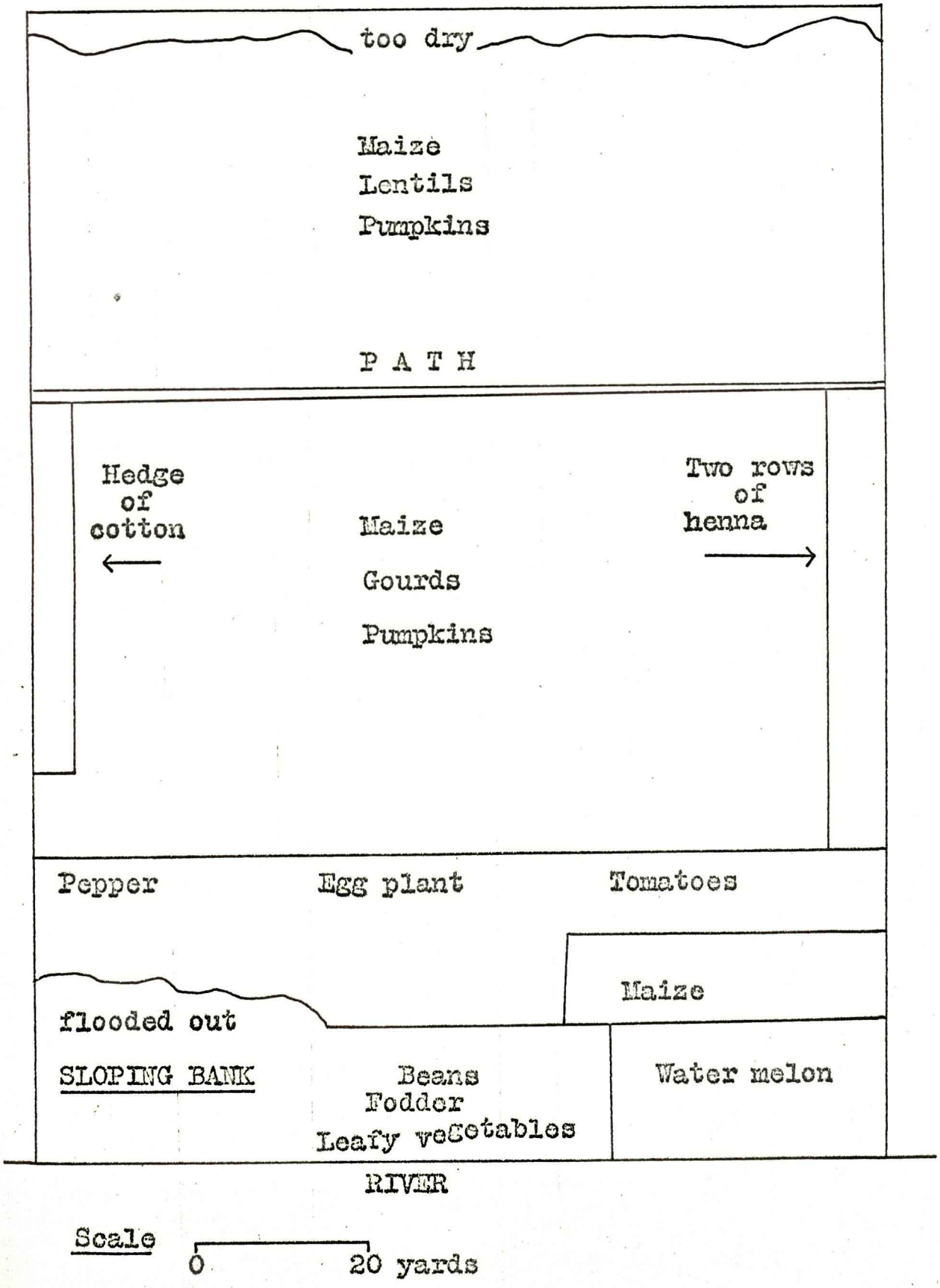
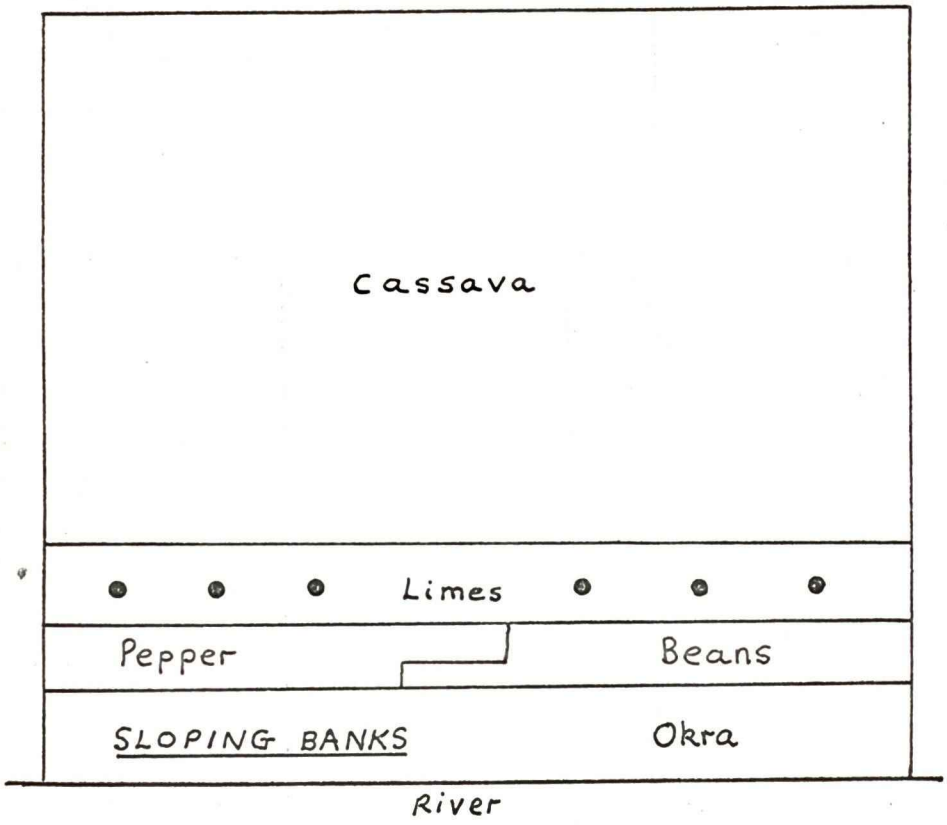
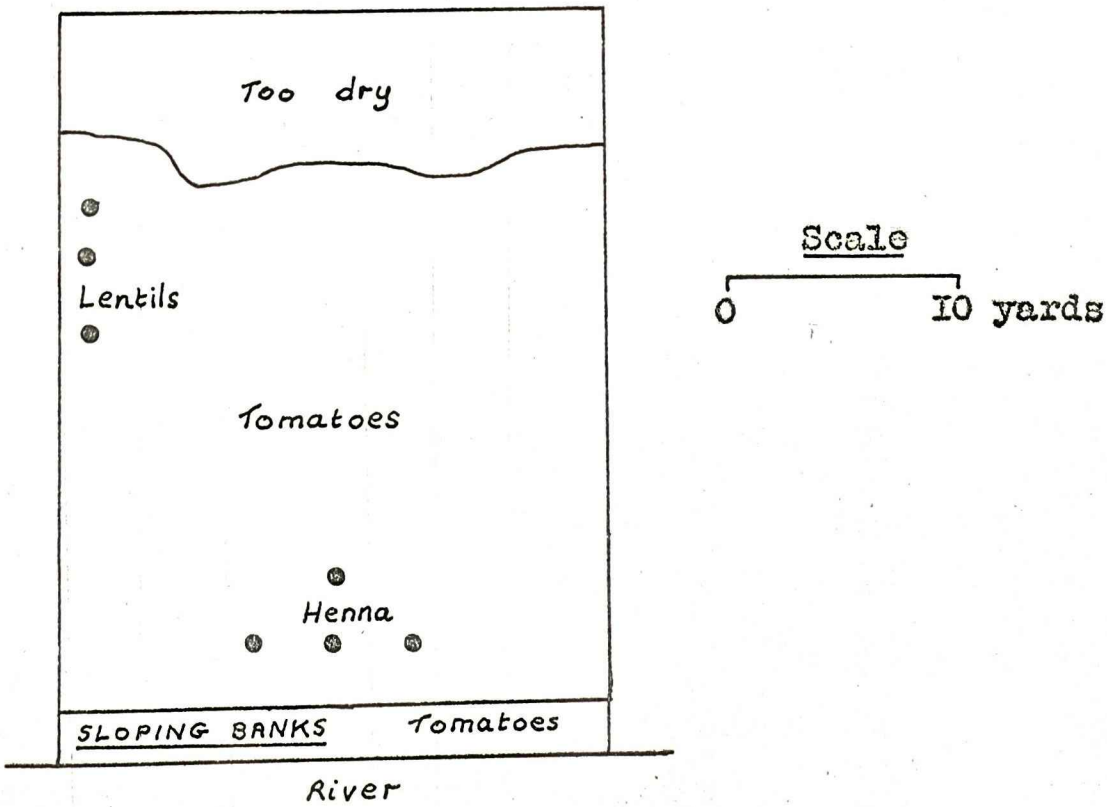


FIGURE 62 cont. GERF

2) Holding at Calipha near Hawata



3) Holding at Ruvina in the north



part of the dry season.

CATTLE.

The number of cattle owned by permanent villages along the Rahad decreases from north to south. For example, of the ten northernmost villages studied seven had cattle compared with only two of the ten southernmost ones. Further south, the climate, flies and water-borne diseases worry beasts even more than human settlers. The local people have not adopted the technique of making smoke screens around their stock at night to ward off insects, as practised by the Dinka who previously used the area in the rains. Moreover the villages in the south are newer and many of the pioneers have not yet accumulated enough wealth to buy cows nor do they wish to be hampered by them.

Although the traditional cattle owners of this area are Arab other tribes also own stock. Almost 70 per cent of Fulani communities have accumulated good herds of cattle and have adopted Arab techniques of management. Although the Hausa are purely agriculturalists in their homeland about 40 per cent of their villages along the Rahad have cattle. They are concentrated mainly in the North, where Hausa settlements are older, where they have been more influenced by neighbouring Arabs than in the south, and where physical conditions are most favourable for animal

raising.

The flooded, humid conditions of the south are still generally considered unsuitable for beasts in the rains. Of the thirteen villages south of Hawata that have cattle, eight send their beasts north to Butana with a group of Arab nomads. This arrangement seems to work satisfactorily as far as Arab villages are concerned, but West Africans complain that they cannot trust their Arab herders, who fail to return the correct number of animals. They are thus reluctant to keep beasts if they cannot look after them at home all the year.

As villages in the south grow in size, years and wealth, they begin to acquire beasts. As settlement thickens, the fly-sheltering vegetation is cleared and it becomes possible to keep beasts in the village, even during the rains. This rainy season migration of stock to Butana is therefore declining, although the number of animals kept in the southern part of the Rahad is increasing.

Where a permanent village has no cattle the surrounding grazing will almost certainly be used by nomads. A loose, symbiotic relationship develops between the camp and the village. The villagers provide the nomads with dura and vegetables in exchange for milk. The nomads often

return to camp within one to three miles of the same village year after year. Relations between the two groups may be good, but there is often friction, particularly where the villagers are West African. Unwittingly new immigrants may establish their village near a pool traditionally used by a nomadic camp. They become extremely angry when nomadic cattle drink at the pool, which they regard as reserved for human consumption.

Unlike Arab settlers the West Africans block access to the river with their gerf lands, growing crops on banks which previously provided grazing. At least five West African villages complained that they were unable to undertake casual dry season employment if it meant leaving the village, for the Arabs could not be trusted to keep their beasts off their vegetable gardens. Such clashes, while not untinged by racialist feelings are, however, primarily clashes between peoples of different ways of life. A new Western Sudanese village, established four years ago too close to the dry season camp of a Western Sudanese Hill village, is experiencing just the same problems of preserving water and gerf lands as are more commonly experienced by West Africans dealing with Arabs.

In this area, more than in the other parts of Gedaref,

there are signs of tension between racial groups. This is partly the result of wider differences and even clashes in ways of life. But it is also due to differences in the sizes of the various tribal groups. Elsewhere the West African immigrant is not only a new arrival and a foreigner but a member of a minority. In order to "get along" he is forced to mix a good deal with Sudanese and behave in a way acceptable to them. Along the Rahad the West Africans are in a majority. They take courage from their numbers and are much more ready to criticize the Sudanese groups. Two West African villages have even forbidden Arab nomads to water cattle at their village pools which are only for domestic use. The Rahad area continues to attract pilgrims so that villagers, particularly those along the railway or in the virgin south, are continually receiving new West African arrivals straight from home. These serve to remind older settlers of their nationality. Whether at their fields in the rains, or fishing or cotton picking in the dry season, West Africans from the Rahad area seldom come into contact with Sudanese.

STUDIES OF VILLAGES ALONG THE RIVER RAHAD.

1) RUWINA

Ruwina, lying a few miles south of Mafaza, is the most northerly of the riverain villages studied. As in most of the Rahad villages, its population belongs to a single West-African tribe, the Bornu.

Ruwina is only ten years old, but its inhabitants display the characteristics of a much more established group. Over half of them come from the village of Absheba, which was founded about forty-five years ago, and is old by riverain standards. Recently Absheba has suffered from lack of water in the dry season. The bed of the river altered slightly so that instead of possessing a permanent pool, villagers had to obtain sub-surface water from a depth of nine metres, by means of a pit sunk in the sand. Lying seven miles north of Mafaza, Absheba is in an area of marginal rainfall. Several poor dura harvests, combined with the deterioration in water supplies, caused most villages to move to a more southern site at Ruwina.

The first families went in 1951. The main migration occurred in 1953. Then there was no further migration until

1957 and 1958, when four more households left, leaving a very small remnant in Absheba. As soon as the news of the formation of a new village spread, Bornu from other places began to join the Absheba people at Ruwina. The steady trickle of new immigrants has continued, so that now the original Absheba villagers form only half Ruwina's population, (fig.63).

Most of Absheba's settlers came from the Bornu colony at Kassala, where the pilgrims have several villages in the Gash. The uncertainty of rainfall there doubtless encouraged the people to leave for the wetter region of the Rahad. Some of their population, however, came directly from Nigeria, and several families were from the Gezira, where they had been cotton pickers. These places still form the main sources of new immigrants into Ruwina, but in recent years emigration from Kassala has become insignificant compared with that from further west (fig.64).

With only 25 per cent of its population born in Nigeria, Ruwina is scarcely a pilgrim village. In the last ten years only four men have arrived here from home to pause briefly on their way to Mecca. Like other northern villages, Ruwina is scarcely attractive to pilgrims who want to make money fast. It has relatively little gerf and low rainfall makes yields from bildat uncertain.

FIGURE 63.

THE FORMATION OF RUWINA.

Date	Number of families arriving each year 1) From Absheba	2) From elsewhere.
1951	2	2
1952	2	0
1953	9	11
1954	0	1
1955	0	1
1956	3	1
1957	1	0
1958	0	0
1959	0	1
1960	0	0
Total:	17	17

FIGURE 64.

RUWINA. WHERE THE VILLAGERS CAME FROM.

Area	Number of families coming from these areas	
Nigeria	4	
Kordofan	1	
Gezira	9	
Gedaref District	17	(from Absheba)
Kassala	3	
Total:	34	

With three-quarters of Ruwina's population born in Sudan, many of its links with Nigeria have been severed. (fig.65).

FIGURE 65.

RUWINA. VILLAGERS BY PLACE OF BIRTH.

Area	Number of adult male householders born in these areas:
Nigeria	9
Gezira	5
(Absheba	6
(Rest of Gedaref District	3
Kassala	10
Total	34

In view of this, it is remarkable that two-thirds of the people of the village have been to Mecca. Compared with other Sudan-born West Africans the Bornu colony at Kassala is unusually devout. Doubtless helped by the proximity of the Red Sea Coast, nine out of ten of those born in Kassala have seen Mecca compared with only one of those born in Absheba. These, however, are mainly younger men who may hold their religion more lightly in the modern world. Eight out of nine born in Nigeria have successfully made the pilgrimage, although most show no signs of completing the homeward journey.

The village itself is close to the river, but irregular rather than elongated in form. Bornu villages are renowned for their untidiness and haphazard shapes. As in many West African villages, where laws of hospitality

are strong, the chief maintains and furnishes a large rest-house for travellers, who are fed from his kitchen. Both villagers and animals drink from the same large pool. (There are only a few cattle). If the beasts muddy the water unduly, the people may take filtered water from a small pit at the edge of the pool. The pool itself lasts throughout the dry season.

Because it is new, Ruwina found itself without gerf, all the flood land having been allocated to the older villages on either side of it. Gerf in any case is limited in the north, and there is none near to the village site. Ruwina has arranged to rent gerf from the village to the north and fifteen families now have some. Gardens are over a mile from the village. They are very small and the depth of flooding is very variable, so that they cannot be particularly profitable. Those who have been in the village longest have had the greatest chance to acquire gerf. There is no more available for newcomers now. Rather over half those from Absheba have it compared with about a third of those from elsewhere. As the sheikh is from Absheba he may have favoured his fellow villagers and the Absheba people, already used to gerf, may have wanted it more than the other immigrants.

In their dry season occupations, there is not the

variety usually found in a West African village. (see fig.44). Skilled craftsmanship is noticeably absent. The use of camels as sources of dry season profit is uncommon among West Africans. All those doing this come from Kassala and seem to have been influenced by Arab practices. The relative closeness of the Gezira, and the fact that over a quarter of the villagers lived there at some time, makes cotton-picking an obvious dry season occupation.

Ruwina's Bornu, most of whom have been born in Sudan and have adopted many Sudanese customs, are more bitter at their treatment by Sudanese than are most pilgrims. It seems that permanently settled West Africans, particularly those whose families have been in Sudan for two or three generations, want to be treated like Sudanese. They are full of resentment if their tribal affiliations cause them to be treated as foreigners. If allowed to complain, the people of Ruwina are full of stories of discrimination against them by Sudanese officials. (They say children are refused schooling and applications for documents necessary to practise skilled trades are turned down). Ruwina, like many West African villages has an unofficial village shop, not the villagers say, to avoid the annual 4 L.S.tax, but because they were refused a license in an effort to

confine custom to the Arab stores at Mafaza. Whether true or not, these complaints are typical of the older West African villages, whose inhabitants have severed their links with their homeland and know they are permanently settled in Sudan.

2) CALIPHA

FULANI CALIPHA.

Although the Fulani form the two oldest communities in Calipha, they are now far less important in terms of numbers than either the Hausa or the Arabs. One of their communities now has Arabs on three sides, the other is entirely surrounded by Hausa. Both communities are descendants of the political refugees who settled along the Blue Nile. Most of the population of each community comes from a single village near Maiurno. There are few newcomers or aspiring pilgrims. Their way of life is remarkably like that of other old-established groups in the area. (Like Arabs they have a high regard for cattle and leisure, although like West Africans many have gerf).[1]

HAUSA CALIPHA.

The first Hausa who joined the Fulani at Calipha, arrived in 1939. Since then their numbers have grown steadily if irregularly. Some years several groups of

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[1] (Members of only one of the Fulani communities were interviewed and the information obtained from them is probably inaccurate. The Fulani are well known to government officials and anthropologists alike, for their elusiveness and apparent inability to distinguish truth from convenient falsehood).

families have arrived; in other years there has been no-one. Today they form the largest tribal group in Calipha and comprise about eighty-five families. Close to the railway, the village continues to attract many pilgrims, so that its population is continually in flux.

The sheikh and the original settlers came from Mafaza, to obtain fresh land for cultivation. The land around Calipha is now itself over-cultivated. Four years ago a group left to join other Hausa villages from the Rahad to form the Hill village of Shangiya, where they have obtained virgin land for bildat. The group continues to return to Calipha in the dry season to re-open their old homes and cultivate gerf.

Only just over 10 per cent of the present settlers come from the riverain area. A similar number come from the Gezira. The Rahad area in general has attracted more settlers from Blue Nile than the rest of Gedaref District, perhaps because of its closeness and its opportunities for riverain activities. A few Hausa moved here from tribally-mixed villages in the Hills, but the great majority of the community (over 65 per cent) came directly from Nigeria. Once pilgrims who have stayed in a village return home to Nigeria and report on it favourably, the village is ensured of a constant supply of new arrivals.

Over half Calipha's population came originally from Sokoto, and, today, most of the new pilgrim settlers who are attracted to the village come from the same part of Nigeria.

Despite its capacity to attract newcomers, many of Calipha's inhabitants have been in the village for a considerable period. (see Figure 65). Thirteen families have been there for more than twenty years compared with fifteen who have been there less than ten. It is most unlikely that these older pilgrims will ever return to Nigeria. The very fact that the Hausa have two herds of cattle, shows that some are sufficiently settled to undertake long-term capital investment in stock. The keeping of cattle and the use of camels as transport beasts is foreign to the Hausa in Nigeria. The possession of these animals in Calipha shows a considerable adaptation to local customs which is not found among those who are purely transitory. For many years the cattle have been herded by Arabs in the rains, the arrangement having proved satisfactory in this case.

The older settlers have usually acquired gerf, although some have relinquished it when they became too frail to cultivate it. Hausa born in Sudan are generally

less interested in making money than those on pilgrimage and only six out of fifteen have acquired gerf. For the new arrival, there is now little chance to obtain gerf for all is allocated. (Figure 66). The Fulani and Hausa of Calipha not only cultivate their own side of the river, but the opposite bank as far as Hillat Senegal as well.

FIGURE 66.

HAUSA CALIPHA. OWNERSHIP OF GERF.

Periods.	Percentage of settlers arriving during this period who own gerf.
1936-1940	75%
1941-1945	73%
1946-1950	59%
1951-1955	71%
1956-1960	11%

Nevertheless with its proximity to Hawata, Calipha still offers the immigrant ample means of making money in the dry season (see Fig.44). Those labouring include eight porters who all work in Hawata. They walk in daily or take the bus, which goes into town half a dozen times a day in the dry season. Portering in Sudan has become a traditionally Hausa occupation. As a tribe, the Hausa are known throughout West Africa as traders. Here, helped by the proximity of Hawata many pass the dry season in petty commerce. All Hausa are brought up in the belief that they should have some regular profitable occupation in the dry

season. Thus, few except the very old will admit to doing nothing. Many as well as being farmers, are trained in a skilled trade (fig.67). In a pilgrim community those devoting their time to religious matters are highly respected. The faqis are also useful members of society for they teach the Koran and reading and writing of the Hausa language. Most pilgrims are reluctant to send their children to Sudanese schools, even if they could obtain places for them. These faqis therefore provide the only education that the Hausa children of the village receive.

ARAB CALIPHA.

Like the Fulani quarters, nearly all the members of the Arab community come from a single village. All but two households are from Mugdeit and Arab Calipha shows much the same tribal composition as its parent village. (fig.68). (see fig.56).

The link between Calipha and Mugdeit remains very close. Over 50 per cent of Calipha's villagers farm at Mugdeit compared with 35 per cent at Calipha. The average length of time that those farming at Calipha have been settled by the river is 13.4 years compared with an average stay of 12.7 years for those still farming at Mugdeit. These figures are not very significant. According to

FIGURE 67.

HAUSA, CALIPHA. SKILLED CRAFTSMEN.

Craft	Number of men practising it
Barber	4
Tailor	3
Builder	2
Carpenter	2
Hatter	1
Dyer	1
Rope Maker	1
Bicycle repairer	1
Coffee seller	1
Total:	16

FIGURE 68.

ARAB CALIPHA. POPULATION BY TRIBE.

Tribe	Number of adult male householders of that tribe
Jaalin	17
Rufa'a	8
Fung	2
Dinka	1
Dubanya	1
Misallamiya	1
Ricabin	1
Batahin	1
Western Sudanese	11
Total:	43

reports most of the early settlers made new farms at Calipha when they moved. The land here proved infested with weeds, and birds ate the ripening grain. Despite the longer journey to work, many returned to their old fields. Their action discouraged some of the newer settlers from attempting to clear bildat by the river. The remaining 15 per cent of Calipha's Arabs have married girls from other villages, and cultivate near their wives' old homes in the rains, moving the whole family to Calipha in the dry season.

Like those at Mugdeit most Arabs at Calipha have hashab. Over 80 per cent of families have kept the gum gardens they had when they lived in the Hills. Two others have found small amounts of hashab near the river. There is not much near the Rahad, and because of their links with the Hills the Calipha Arabs have more gum than other Arab riverain villages. They have, however, less gerf. Although less interested in gerf than West Africans, long-settled Arabs along the Rahad at least use the flood-land close to their villages. Only three Calipha Arabs have gerf. The Hill migrants are unaccustomed to this type of agriculture and despise it. They had anyway little chance to

acquire gerf, because most had been allocated to West Africans before they arrived. Two, however, are beginning to establish small irrigated gardens.

With these exceptions the Arabs show little interest in riverain occupations. The fisherman and the man going to pick cotton have both been by the Rahad for many years. They are said to have been corrupted by West African influences, for Arabs would not normally do this work, regarding it as degrading.

Most of Calipha's Arabs carry on the same dry season occupations that they pursued in the Hills, oblivious of present economic opportunities (see fig.44). Gum picking and transporting forest produce by camel predominate. Those requiring regular wages can find employment in the local sunut forest reserve. Government departments such as Forestry, give preference to Sudanese workers before supplementing their labour requirements with foreigners.

Arab Calipha has only one herd of cattle, having like Mugdeit, failed to build up its herds after disease, and typically it has far fewer stock than either of its West African neighbours.

3) HILLAT SENEGAL.

Although it lies only five miles from Hawata, Hillat Senegal exhibits most of the characteristics of the southern group of Rahad villages. It is older than the average immigrant village in the south as it was founded in 1939, but as it is the only village of Senegalese in the area, the stream of new arrivals from the west makes the village less stable than its age suggests. Indeed it is estimated that since its foundation, over fifty settlers have cultivated here and then moved on either to Mecca or homewards.

The village was founded by pilgrims coming direct from Senegal and has retained its pilgrim characteristics. Over 40 per cent of its population have come straight from their homes in the west (fig.69). As early as 1941, however, Senegalese from tribally mixed villages in Gedaref began to join their fellow countrymen at the Rahad. Today they form 36 per cent of the households. Seven years ago the few Senegalese families who had been living with the Nigerian Hausa at Calipha arrived. In 1960 groups came from Humra and Gedaref Town. They had heard that a band of pilgrims had just left Hillat Senegal for home, so that there was ample land already cleared available at the

village.

FIGURE 69.

HILLAT SENEGAL. WHERE THE VILLAGERS CAME FROM

Area	Number of families coming from these areas.
Senegal	15
Darfur	1
Kordofan	1
Blue Nile	2
Khartoum	4
Gedaref District	13
	36

Hillat Senegal is essentially a village for people from a certain territorial area, irrespective of their tribe. All the villagers were born and bred in what was then French Senegal but this may be their only common bond. Not all even have a common language. Senegal lies so far west that not many undertake the very arduous journey to Mecca. If the village were restricted to members of one tribe, there would not be enough settlers to maintain a viable village, and occasional pilgrims from other tribes would have nowhere to go. Far from their tribal organizations, tribal ties weaken, and the village has three examples of intermarriage between Senegalese of different tribes. All travellers from Senegal entering the area, seem to proceed to this village where they automatically receive hospitality. Thus, the villagers are kept well

informed of events in their home country. Memories of home are so vivid that one man persists in building flat-roofed mud houses, like those found in Senegal, despite the fact that unsuitable soil and heavy storms cause them to slump and collapse each rains.

If the three families away at Mecca at the time of the questionaire are included, almost half the villagers had made the pilgrimage. The proportion is highest among the longer settled householders, but recently several families have travelled straight to Mecca, pausing to earn more money only on the way home. It now seems to be easier to save enough money to complete the one-way journey without a halt. Two-thirds of the families have been less than eight years at Hillat Senegal but there is a hard core of people who have stayed over twenty years (fig.70). Many of these are virtually permanently settled here although none would be prepared to admit it. Six families who have been more than nine years in the village and one six-years-old household have planted fruit trees. These take several years to mature and show that their owners intend to stay some time. In 1961, for the first time, several villagers bought cattle. Previously, as in most

new West African villages, they had relied on goats.

FIGURE 70.

HILLAT SENEGAL. DATE OF ARRIVAL OF VILLAGERS.

Date	Number of families arriving during this period
1936-1940	3
1941-1945	3
1946-1950	5
1951-1955	9
1956	1
1957	1
1958	2
1959	2
1960	10
Total:	36

Like most small villages in the under-populated south, Hillat Senegal has ample gerf land, for floods here are extensive. Some of the gerf which could be Hillat Senegal's is at present used by Calipha. In spring, 1961, two-thirds of the families had gerf and the nine households who had arrived the previous year were waiting to be allocated it. The only people who had none were three old men who were too frail to cultivate it and the village simpleton.

Other dry season occupations follow the usual West African pattern (see Figure 44). The range of crafts is more limited than among Hausa at Calipha but this may be

simply because the village is smaller. As Hillat Senegal is further from Hawata there are fewer porters, traders and daily labourers. The absence of local wage employment encourages some to migrate in the dry season either to pick cotton at Gezira or to fish in the White Nile. Relying on remoteness from administrative authority, the water carrier operates without a licence, which would anyway be refused to a West African. Two ordinary huts hidden behind compound walls illegally serve as shops selling basic foodstuffs.

The village itself is well built (fig.71). The huts and grain stores are surrounded by compound walls of woven straw which are at least 3 metres high (women are strictly secluded). The houses are built close to the river on the crest of the levee. During the rains the land behind the village is flooded. This area is very suitable for growing maize, while the gerf close to the river is kept for vegetables. (fig.72). Maize is the staple grain of the village. Simsim is widely grown on bildat as a cash crop. It is a more profitable rain-grown crop than dura, which is scarcely cultivated because the birds eat it.

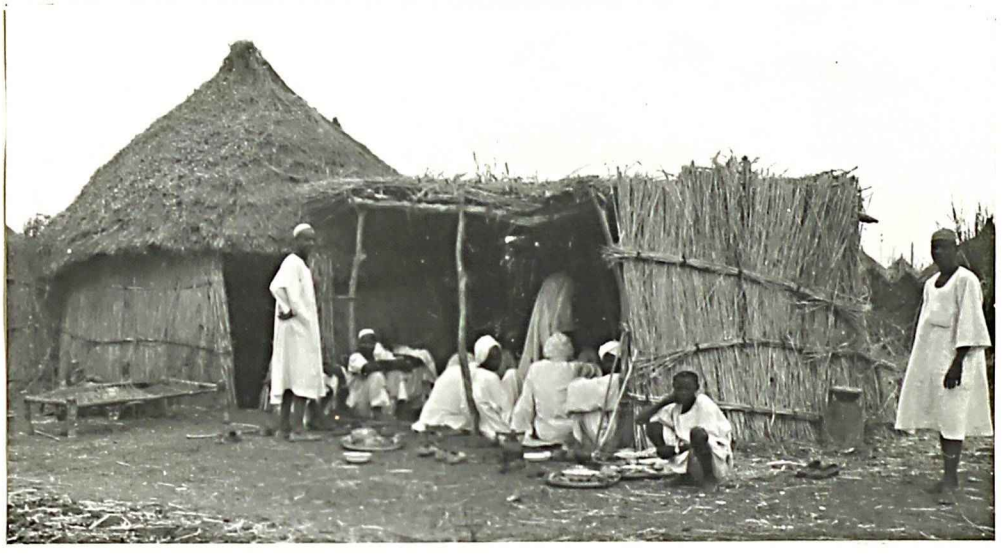
The villagers and animals drink from a single pool. The Senegalese are not over-particular about the cleanli-

FIGURE 71 HILLAT SENEGAL. A VILLAGE ALONG THE RIVER RAHAD

WEST AFRICAN HOUSING

High walls seclude women

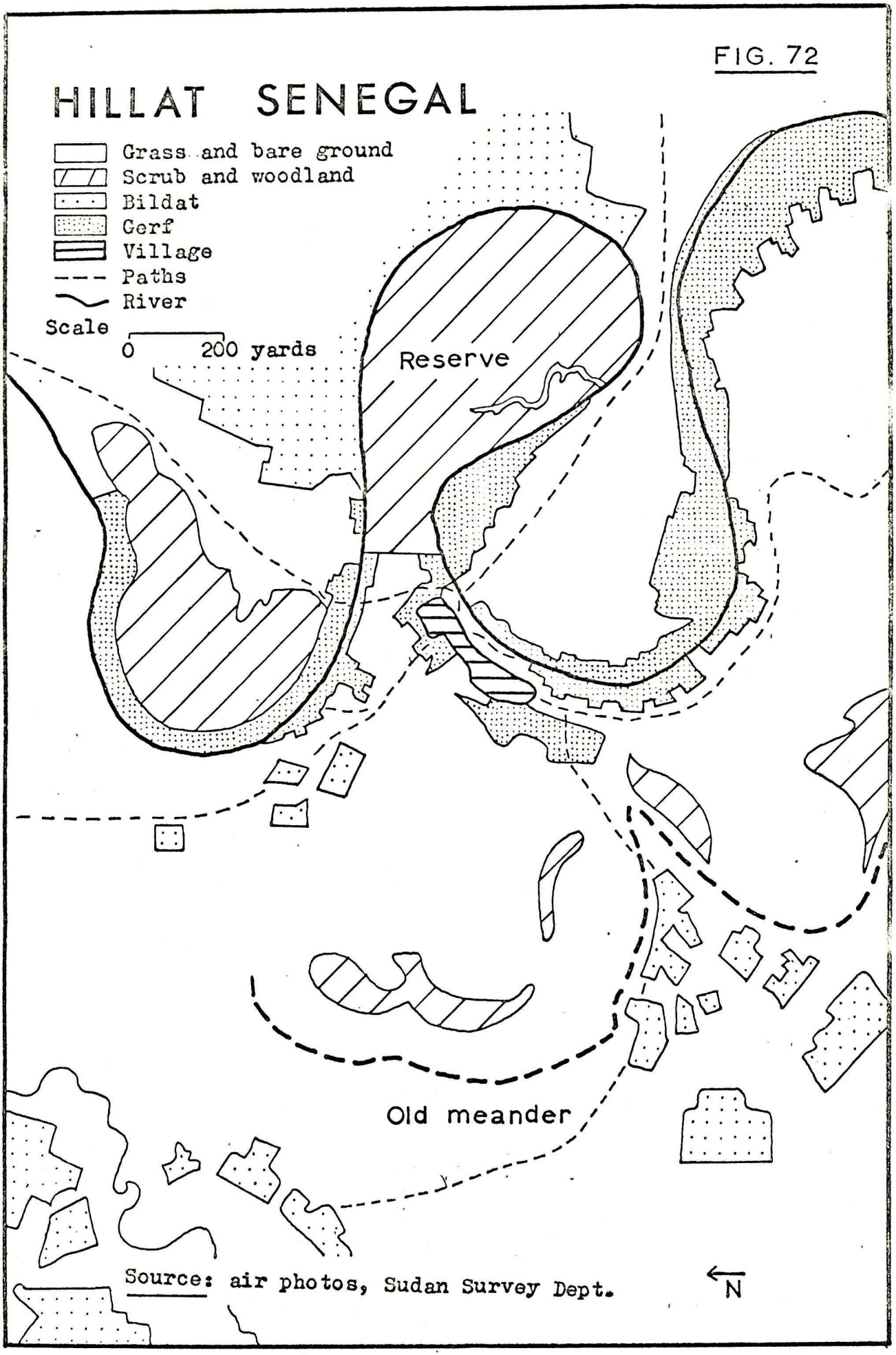
FIGURE 71 Cont'd



Guest house for pilgrim visitors. The chief providing food

Square mosque, and fire round which children sit to learn to recite the Koran each night

FIG. 72


HILLAT SENEGAL
Grass and bare ground
Scrub and woodland
Bildat
Gerf
Village
Paths
River
Scale
0 200 yards
Reserve
Old meander
Source: air photos, Sudan Survey Dept.
N

ness of their water. During the dry season an Arab camp is set up about 1½ miles from the village, but it has its own pool. Nomads enter the village only to sell dairy products. Nevertheless the villagers make their gerf seedbeds on top of the river bank a few metres from their houses to protect them from straying Arab cattle.

Like most southern villages Hillat Senegal is very cut-off in the rains. Because of flooding, the area is heavily infested with insects, and there is considerable sickness. Yet it may take a day's travelling through knee-deep mud and swamp to reach the dispensary at Hawata. There is no road on the west of the river. Throughout the year, all goods leaving or entering the village must be carried by man or beast. It is not therefore surprising that four pilgrims have invested over 30 L.S. each to buy four camels. The wide, spreading feet of these animals enable them to travel reasonably well across the clays in the rains as well as during the dry season.

CHAPTER VII

THE GEDAREF RIDGE.

HISTORICAL SUMMARY.

Immediately before the Mahdia the political power in the Ridge was divided between the two main groups, the Shukriya in the North and the Dubanya. Both groups had considerable settlements and there was fairly widespread cultivation. Gedaref, centre of authority in Fung times, was a military and commercial centre with over thirty European merchants. Doka, lying between Gallabat and Gedaref on the Ethiopian trade route, had an important market.

During the Mahdia the area was devastated, particularly in the South, where disease threatened a hungry population, whose crops had been destroyed. There was a large Mahdist garrison at Gedaref and when rains stopped fighting Western Sudanese soldiers began cultivating abandoned fields.

RESETTLEMENT IN GEDAREF.

After the Mahdia the remaining Arabs re-established themselves in their former areas. Figure 73 shows the

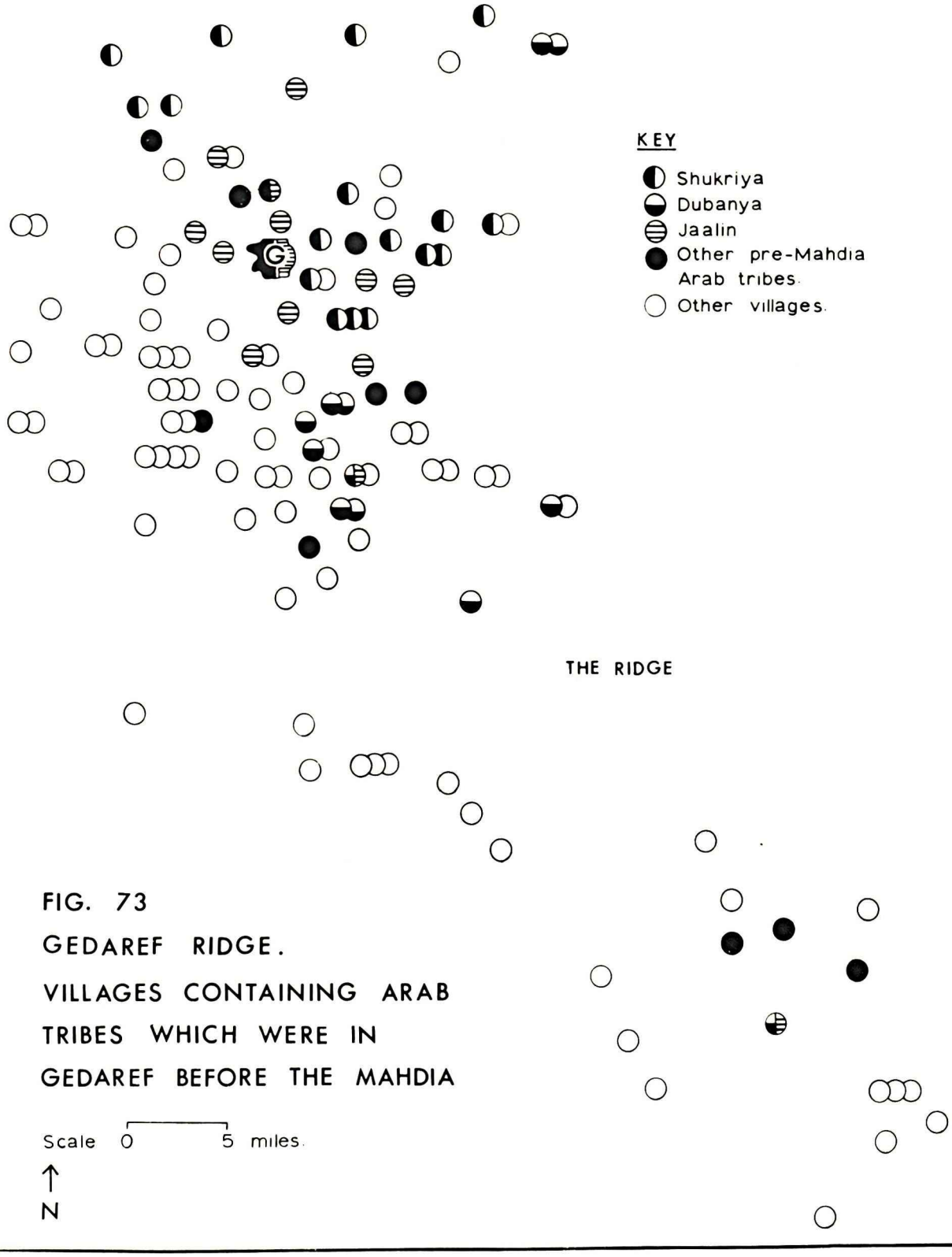


FIG. 73

GEDAREF RIDGE.

VILLAGES CONTAINING ARAB TRIBES WHICH WERE IN GEDAREF BEFORE THE MAHDIA

distribution of the main Arab villages today with the Shukriya and their Nazir in the north, Dubanya, a minority group in the south, and Jaalin around Gedaref, in just the same areas as they occupied before. There are small numbers of other Arab tribes, mainly in the south, such as Ricabin and Jawama, who have been in Gedaref since Turkiya times although their main tribal areas are in the Western Sudan. As in the Nahl Hills there are a few Dinka, but these probably came as soldiers in the Khalifa's forces. In the north there are some Lahawin, Misallamiya from Butana, and Boidre, all of whom have been more or less absorbed by the Shukriya. The Boidre are dominant around Gedaref Town. During their conquest by the Shukriya they may have lost their animals and been forced to become cultivators. They therefore settled in the most well-watered southern part of the Shukriya domain. Indeed Figure 74 shows that 45 per cent of the villages in the North Rural Council and 25 per cent of those in the South Rural Council have been peopled by the same tribe since the Turkiya. An additional 18 per cent of the villages in the south were Arab before the Mahdia but were repopulated afterwards by Western Sudanese soldiers. These settled mainly around Gedaref which they

knew. When the British divided the area those who found themselves in the non-Western Sudanese area moved to the south. (figs.39 and 40).

FIGURE 74.

THE GEDAREF RIDGE. AGE OF VILLAGES.

Period.	Number of villages formed during this period and existing in 1962. North Rural Council.	South Rural Council.
Pre Mahdia(1883)	18	20
1884-1910	3	20
1911-1920	3	6
1921-1930	6	13
1931-1940	2	7
1941-1950	7	14
1951-1960	1	8
Total	40	78

In the north most of the earlier settlements were probably reoccupied. In the south, however, land was now under thick secondary forest and the area was unhealthy. Only the area round Doka was reopened, the sites of other villages which are said to have existed becoming lost in the bush. For about thirty years there was little expansion of settlement, although there was a trickle of Sudanese immigrants and the West African pilgrimage was resumed. It was a period of recovery and consolidation and of a gradual natural increase in population. In the 1920s the railway stimulated immigration and this, combined with the natural increase of population, resulted in over

15 per cent of the existing villages being formed during the decade. Since then, perhaps as a result of the decreasing number of sites with prospects of good water, the establishment of new villages has proceeded slowly, apart from a phase of activity in the North between 1940 and 1950.

Most of the newer villages are Western Sudanese. Attracted to the south, not only for political reasons but because of the prospect of more land and reliable rain, (fig.75), they tended to fill the unpopulated gap between Doka and the Gedaref region, or to settle around the edges of the main ridge (see fig.39). Few West Africans (except Bornu) have settled in these newer villages, possibly because their water supplies are often inadequate. In recent years, indeed, the Bornu, who are now found in thirteen villages, are the only West African tribe to have contributed a significant number of immigrants. It seems that the majority of pilgrims now find other parts of the District more attractive for settlement. Most of the West Africans have been in the Ridge over forty years and are settled in the well-watered central part of the area. They consist mainly of Hausa, who are found in about fifteen villages, and Fulani who are found in fourteen villages but who, unlike the other two tribes, are seldom found in large numbers in any settlement.

FIGURE 75.

GEDAREF RIDGE. TRIBAL COMPOSITION OF VILLAGES.

Number of villages containing:-	
Arabs only	40
Western Sudanese only	43
West Africans only	17
Arabs and Western Sudanese	2
Arabs and West Africans	5
West Africans and Western Sudanese	9
Arabs, West Africans and Western Sudanese	2
Total	118

The older, mainly Arab settlements, in the area have multiplied by a process of "budding". It is a peculiar feature of this area that when a village reaches a certain age and size, it often divides and forms an offshoot. Some fifteen villages have spawned in this way. In nine cases the offshoot village has established itself with its own sheikh less than half a mile away from the original village and continues to share its water supply. When this occurs the budding seems to be the result of a tribal or administrative dispute. (Doubtless it is difficult to organize a large village as a single unit.) In other cases, when the offshoot has moved further away, it has been in search of better land or water.

LOCATION OF WATER POINTS AND VILLAGES.

More than in any other area villages are sited where

well water is available. Only one village in the area is more than half a mile from a well and only four are not dependent on wells as their primary source of water supply. There are two hundred wells in use to supply just over a hundred villages.

In contrast there are only about fifty hafirs, and most of these are so shallow and silted as to be almost useless. There is only one example of a hafir serving as the main source of supply for a village. Figure 76 shows the declining importance of hafirs in this area compared with their increasing use in the Nahl Hills and the Plain. There are two successful bores in the area and fifteen failures.

FIGURE 76.

DISTRIBUTION OF HAFIRS.

Period.	Percentage of hafirs constructed in each area during these periods, which were still in existence in 1962.		
	Gedaref Ridge	Nahl Hills	Plains
Pre Mahdia	57	29	14
1901-1920	-	-	-
1921-1940	43	51	6
1941-1960	25	32	43

Good well water is available in the more elevated areas of the ridge, where the rock whether basalt or Nubian

sandstone, either rises above the clays or is covered with so thin and stony a clay mantle that percolation can take place. The basalt crest of the ridge, contains 79 per cent of all wells in the area, while the underlying Nubian, being lower, has fewer outcrops and provides only 8.5 per cent. (see fig.18).

The amount of water available usually depends on the size of the catchment. Thus the pediments of the larger hills, where streams concentrate run off, form excellent sites for wells and settlements. A few large villages, however, are found several miles from hill masses, apparently out in the clay plain. They are actually sited on stony clays which betray the presence of weathered rock a few feet beneath the surface, and permit percolation. Water comes from large khors which have reliable flow. Wells are sited as close as possible to the khors to make use of the perched water table beneath them. In parts of the south and on the edges of the ridge less favorable well sites are tried. Villages are situated on low rises with a well at their foot. The rise with its inadequate catchment and low permeability is the sole source of supply for the well which, not surprisingly, yields little.

SHAPE OF VILLAGES.

Pediment villages tend to be compact. Where no

definite hill sites exist, however, the settlements seem to be more dispersed. Both pediment and khor-sited villages tend to be built round their wells, a phenomenom that is seldom found outside this area (see Chapter V). A khor-sited village may straggle out on either side of the khor in a kind of embryo ribbon development leaving the central area bare because it will flood in the rains.

Part of the reason why pediment villages are more compact than others is that they are mostly inhabited by Arabs (Western Sudanese who predominate elsewhere have very unconsolidated settlements.) Arabs prefer to live in single tribe villages, if necessary forming several around a central water-point, rather than share part of a larger village. Thus 71 per cent of all their villages consist of a single tribe only. Strangely enough, once the tribal concept is abandoned they show no preference for sharing with other Arabs. Only 9 per cent of their villages contain members of different Arab tribes.

Western Sudanese appear to share readily with other Western Sudanese. Nearly all Western Sudanese villages contain members of several tribes. Outside their own tribal group they mix most freely with West Africans, probably because they, too, are recent arrivals and have more in common with them than either group has with the

Arabs. West Africans are found in 16 per cent of Western Sudanese villages.

Only 51 per cent of the West Africans are found in purely West African settlements. Nearly half, perhaps because they have tended to arrive here in small numbers have settled in existing Sudanese villages. There are, however, about 26 per cent of them who have formed single tribe villages showing that where numbers are large enough, tribal considerations reassert themselves. Although they predominate in the South Rural Council rather than the North, they mix more freely with Arabs than do the Western Sudanese. 33 per cent of their villages are shared with Arabs whereas only 7 per cent of the Western Sudanese villages contain Arabs. Except for the large villages, most Arab settlements are compact in shape and administered by only one sheikh. This is usually true even if there is a minority group of West Africans or Western Sudanese in the village. The Western Sudanese or mixed Western Sudanese and West African villages are more often irregular in shape and administratively fragmented. With the number of tribes involved in a village of this sort it is not perhaps surprising. What is remarkable is that in many of the smaller, newer and particularly the more remote villages members of different tribes co-operate in facing the challenge of a hard virgin environment and manage very well with one

sheikh.

MOVEMENTS OF VILLAGERS AND VILLAGES FOR WATER.

Figure 77 shows that apart from the Rahad, the Ridge has the most adequate supplies of water of any of the four environments. Two-thirds of the area's villagers are able to drink throughout the year from their village water-points, rather less than a third having to fetch their water from neighbouring villages, and under 5 per cent being transhumant.

Four villages in the North are transhumant. Their Ridge villages are dependent on seasonal wells, and recent attempts to supplement these with mechanical hafirs and bores have failed. The people and animals go off to established dry-season camps on the R.Atbara, just as people from the Nahl Hills move to the Rahad. At present poor rainfall in the far north of the Ridge makes this move essential. (fig.78).

FIGURE 77.

GEDAREF RIDGE. WAYS OF LIFE.

Percentage of villages practising the following ways of life:

	North Rural Council	South Rural Council
Fully settled	51	73
Making local movements to obtain water in the dry season	40	25
Transhumant	9	2
	100	100

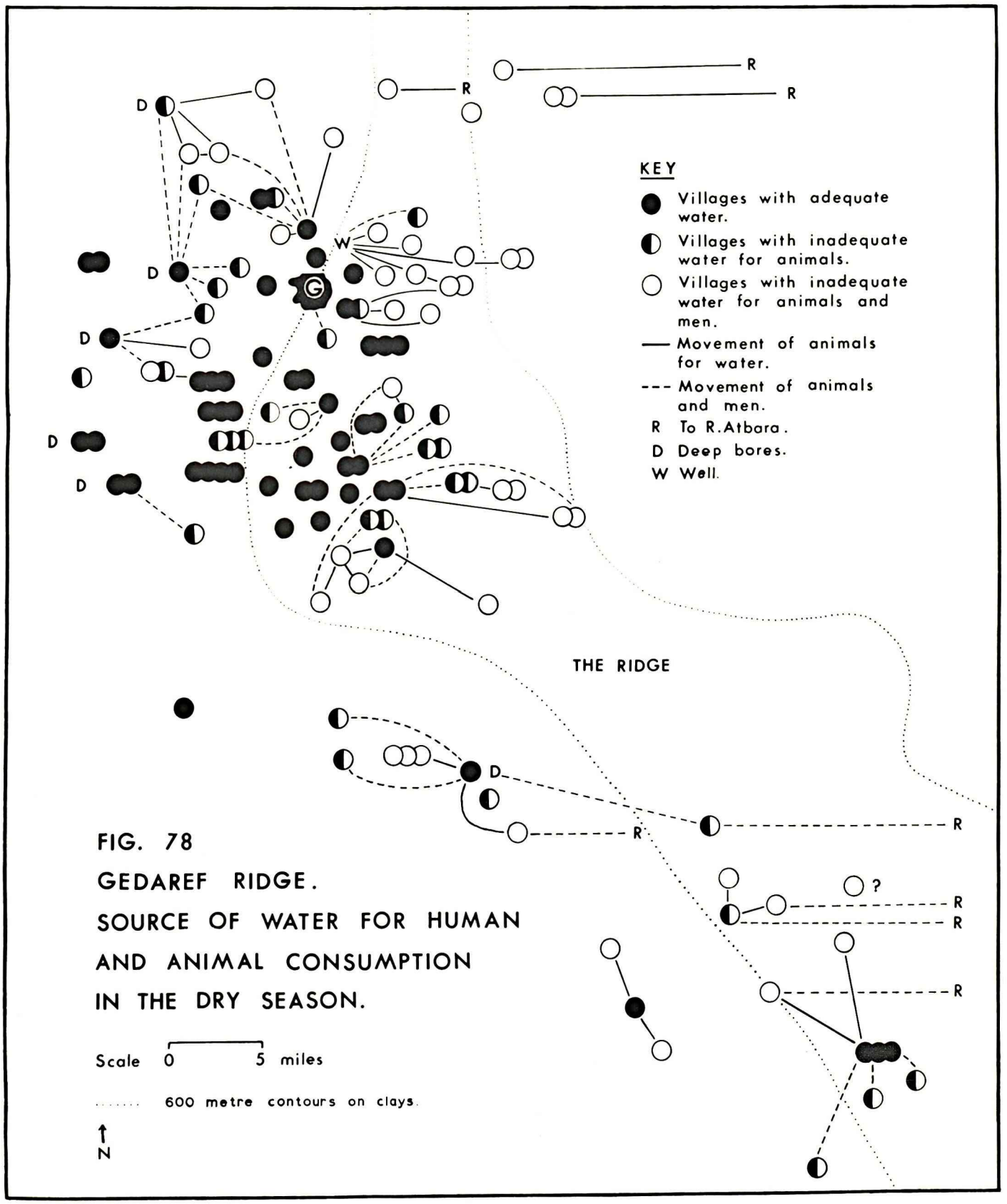


FIG. 78
GEDAREF RIDGE.
SOURCE OF WATER FOR HUMAN AND ANIMAL CONSUMPTION IN THE DRY SEASON.

The most characteristic movement for water in the area is the "local" movement of villagers, who travel daily to a neighbouring water-point to fetch water for their families. The movement is normally from ill-watered outlying villages to the better wells along the crest of the ridge. (see fig.78). For some villages water has to be fetched in this way from the end of December, but often home supplies may last until February, March or even April. As water begins to run short, families individually decide that it is time to begin fetching their water from elsewhere. There may be a gap of weeks or months between the time when the first villagers adopt a local movement for water and when the last reluctant householders follow suit. Often the home wells continue to yield just a little water throughout the dry season, and the old and frail, who could not fetch water from further away, can continue to use them. The deep bores on and west of the ridge act rather like wells on the crest of the ridge and with their ample water supplies attract local movements to them.

Most of the villages whose home water supplies are adequate throughout the year are either small (and usually new), or situated in the centre of the ridge. Here even large communities of two or three thousand may be able to drink freely all year, together with their animals.

CHANGES IN SETTLEMENT PATTERN IN RESPONSE TO WATER SUPPLIES.

There is only one known case of a village being completely abandoned because of the failure of its water-point. In this case the village was sited on a small rise in the clays, and a very deep low yielding basalt well finally became too salty for use. There are three examples of part of a village moving away from an inadequate source of water, thus leaving those that remained with rather better supplies. Several villages have moved a mile or so in order to be closer to the source of water upon which they were already relying. It seems that in the past villages were more reluctant to be close to one another, and although sharing the same water-point lived widely separated. Later, continued peace and de-tribalization made settlers more prepared to live close together and villages moved in towards their central water-point. Both deep bores have attracted settlers, in each case the majority coming from the nearest village, so that the original migration was little more than a "budding off" process. Settlers from elsewhere, however, have since joined both villages.

MOVEMENTS OF VILLAGERS AND SETTLEMENTS FOR LAND.

As the population of the Ridge increased, the central part where water supplies were best became crowded, and

the surrounding land over-cultivated. New arrivals were faced with the option of walking a long way to their farms in the rains, or a long way to their water in the dry season. For the older settlers the choice was different. Where old settlements were only two abreast along the crest of the ridge the problem of over-cultivation could be solved by simply extending their fields further out into the plain. However, the older settlements are now often hemmed in by newer ones on the margins of the ridge, and new land can be obtained only by "leap-frogging" over the more recent village. The choice is often between continuing to cultivate a field that has been continuously farmed for over twenty years or clearing a new farm so far away that the farmer cannot get home at night.

A recent agricultural survey[f] showed that over 15 per cent of the fields in the central areas of the Ridge had been in continuous cultivation for over 20 years, and only 18 per cent had been farmed for less than five. Dura yields had dropped from 500-1000 litres per feddan to 300 and simsim yields from 200-300 litres per feddan to 75-100 on the older fields, and farm incomes were much

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f (Baptista 1961:20)

reduced. (The fact that these fields continue to produce at all is a remarkable tribute to the resistance of the clay soils to exhaustion).

Today, over thirty of the villages in the central part of the ridge have some of their bildat far out in the clay plains, mainly in the Gabob area to the east, or around Um Sugura and Um Bileil in the west. Even if, as often happens, labourers are employed on these far fields, the farmer still has to spend a good deal of time away from home supervising or fetching water for his labourers by camel.

Because it is impossible to cultivate distant fields without adequate transport several villages in the centre of the Ridge have been abandoned in the last twenty years as the inhabitants, grown poor as a result of decreasing yields and hemmed in by other villages, lacked the beasts to carry them and their water to newer farmland.

For some villages the move to the far fields has become so common that village agricultural camps are established where water supplies permit. At Abu Asal, where some of Genen's people cultivate, a hand-dug hafir

enables whole families to move, and a well-built rainy season village has sprung up. The group has become regularly transhumant.

In over half the cases where there has been a "budding" of villages and the offshoot has moved far away, the motive for movement was desire for new land. In the last twenty or so years, indeed, more villages in the Ridge have probably been sited with good land rather than good water supplies as a primary consideration, simply because near the main areas of settlement the former rather than the latter was in short supply.

Many villages, particularly in the north, lost harig and far-off bildat land when the Mechanical Crop Production Schemes were established. Others had their bildat consolidated into one block so that possibilities of having enough land for fallow were reduced. The Ridge, indeed, is the part of the District that has been most affected by the schemes. It is the area where, copying scheme-holders, private farmers in the villages have begun to own tractors. In the Nahl Hills no one except the Nazir and Khalifa at Ban has them.

The main owners of tractors are Arabs. Shasheina and Qureisha, strongholds of the Dubanya, situated out in the midst of the plain, where plenty of land is available,

have nearly ten tractors each. While it is mainly Arabs who are rich enough to buy tractors some of the older Western Sudanese villagers have acquired them. Indeed, according to many owners, so many people in the central part of the Ridge now have tractors that the rate for hiring them has dropped from 2 L.S. to 1.15 L.S. in the last few years.

DRY SEASON OCCUPATIONS.

If some lost harig or bildat as the result of the establishment of the M.C.P.S., even more lost hashab. In many villages, especially in the north, only one or two people now have it, whereas before the majority had gum holdings. Almost all hashab owners in the Ridge are now Western Sudanese from the South. There is some movement of Western Sudanese and West Africans out of the area in the dry season, in order to pick cotton. In five villages this move is on a large scale and is triggered off by shortage of water. But, in another half-dozen or so villages, only a few people go and they do so for economic reasons, not because water supplies are inadequate.

Typical Arab dry season occupations such as using animals to extract forest produce have received an indirect

fillip from the M.C.P.S. The organization of the schemes has caused Gedaref Town to expand enormously so that there is a continuous demand for building materials. Deaforestation is so extensive locally that timber now has to be fetched from the forests in the far south of the area studied.

Before the M.C.P.S., Gedaref was simply an administrative centre, an army base and a market town on the railway. It offered few services and had a small population. With the coming of the M.C.P.S., it became one of Sudan's major agricultural centres. With new hafirs and bores established in the District it became a focal point for immigrants. In the census year (1955) its population was 17,000. It is now estimated[f] to average 50,000. During the dry season it swells to about 70,000 with the influx of seasonal labourers who have been laid-off by the schemes after harvest and who are seeking casual jobs until the next cultivation season. During the agricultural season it falls to 35,000. The immigrants live in tribal quarters

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[f](Gedaref Town Council estimates 1961)

which sprawl out beyond the functional centre. Indeed Gedaref Town resembles a gigantic segmented village, which has mushroomed almost overnight.

As its functions and population expanded so Gedaref has drawn more and more of the surrounding villages into its orbit of influence. Villages such as Diem Bakr have been completely absorbed into the urban conglomeration and others such as Sofi, at present a third of a mile from the edge of town, shows signs of going the same way. Seven villages within ten miles or so of town show suburban characteristics. They rely heavily on Gedaref for shopping facilities. Many of the men commute into town during the dry season to temporary jobs of various sorts. In the villages within a couple miles or so of Gedaref, a fair number of people are permanently employed in town. Nearly everybody still has a farm, but it is often so small and over-cultivated in this densely populated area that incomes come increasingly from the town. Several villages, exploiting their excellent water-points, have developed a commercial dairy industry, being close enough to send milk daily to the Gedaref market.

THE KEEPING OF CATTLE.

The movements of cattle are a much more sensitive

indicator of the state of water supplies than are movements of people (see fig.78). The fact that villages around Gedaref Town can keep herds of dairy cattle gives a clear indication of the large quantities of water available.

For the Ridge, as a whole, movements of beasts are greater than those of men. 14 per cent as against 5 per cent are transhumant. 40 per cent rather than 30 per cent make local movements. Only about 36 per cent of the villages with cattle water them at home all year. (The proportion of villages with no cattle is higher in the South (12 per cent) than in the North (8 per cent). This is as one would expect with the large number of Western Sudanese and West African recent arrivals in the South).

The main patterns of stock movement in the area can be summarized as follows:-

1) <u>The North Atbara Circuit</u>. In the far north-east of the area water supplies are totally inadequate for both man and beast in the dry season. All the cattle from four villages, all the people from three and half those from the fourth, make an annual transhumant movement from the Ridge to their dry season camps on the Atbara. Cattle

usually precede the men. They leave when their hafirs are empty while men remain, using diminishing supplies of well water until after harvest. When the rains come men and beasts return to their Ridge village. Cattle remain here throughout the wet season. The surrounding lands are not fully cultivated so that there is grazing available locally at this time. Moreover, as far north as this, it is relatively fly-free even in the rains.

2) Reverse Butana Circuit. This kind of movement is found among six villages with large numbers of cattle in the more heavily-cultivated central areas. To avoid flies and obtain good grazing the cattle spend the rains with nomads in the Butana, returning to their villages after harvest. They then remain in the village drinking there or locally for about four to five months. Then if water supplies are short they go to the Atbara until the rains come in about six weeks' time. In these villages a few milk cows may remain at home all year.

3) The South Atbara Circuit. This is a transhumant movement of cattle, unaccompanied by villagers who have enough water for themselves. The extent to which it is carried out varies considerably from year to year, depending

on rainfall and the consequent degree of water shortage. It is much less organized and regular than the movement to the River in the north. Should water supplies be scarce, about half the cattle from eight villages in the Doka group are sent to the Atbara, the other half continue to drink locally and provide milk.

The pattern of movement in the past was rather different. The Atbara migration always existed but flies have always been bad in the southern area and bandits have always been a problem near the Ethiopian border which comes close to the river. Many people of the Ridge used to take many of their animals to the Rahad instead.

4) Ridge-Rahad Circuit. This Ridge-Rahad migration has now virtually died out. The Dabanya, who used to practise it as part of their regular movement, did not resume nomadic life after the Mahdia. Some of their cattle continued to make the transhumant journey to the Rahad (as did those from Zirega and possibly other villages) until about twenty years ago. Very recently, Tamergu, a new Western Sudanese village in Gabob east of the Ridge, was forced to adopt this transhumant move to the Rahad, when the establishment of the M.C.P.S., reduced its grazing areas.

Generally, however, transhumance is on the increase as new mechanized hafirs and bores are being opened up. One of the transhumant villages in the north-east which received a new hafir in 1962 will probably now drop out of the Atbara circuit.

Despite the fact that the Ridge contains a high proportion of Arabs, who were once nomadic, present day nomadic and transhumant cattle movements are less important here than in the Plains area or Nahl Hills, largely because water supplies in the Ridge are more adequate.

Local movements of cattle generally follow the same pattern as human ones but are more pronounced. Over nine of the villages on the edge of the plains that have cattle have to send them so far to water on the crest of the ridge that they are watered only every two days. Before the bore in the south was sunk several other villages had to adopt this practice of watering every other day. Watering of cattle by local movements is the most common method in the Ridge. It is scarcely found in other parts of the District where village water supplies are either adequate for watering beasts the year round or where supplies are generally so short throughout the area that

animals have to be sent completely away.

Home cattle are to be found mainly in the centre of the Ridge, or in other villages where their numbers are so few that they drink comparatively little, and can therefore water at their villages water-point all the year.

IRRIGATED GARDENS.

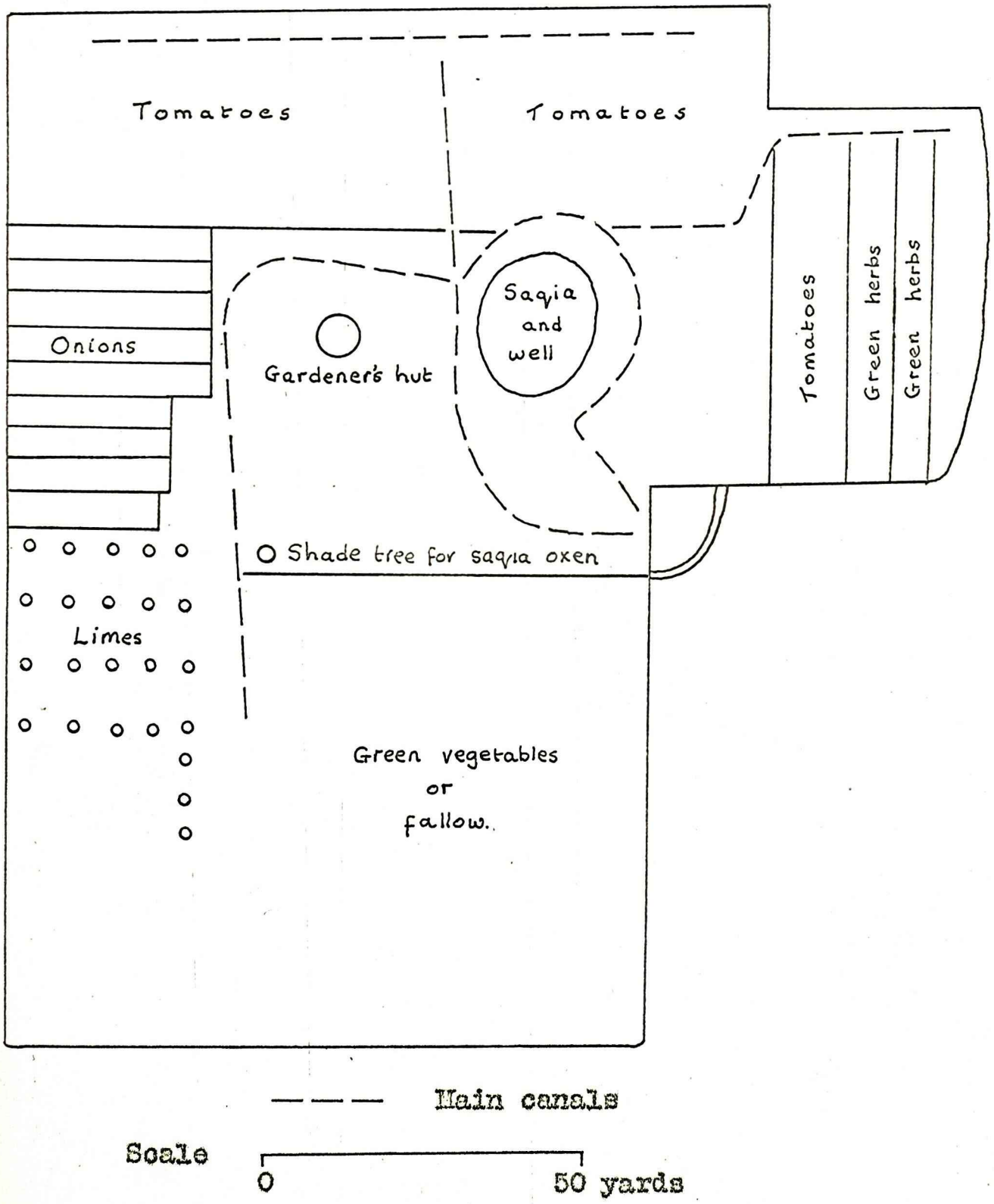
The importance of the Ridge as a source of ample well water is shown by the fact that it is only here that there are wells sufficiently high yielding and shallow to be used for irrigating gardens. They occur in both basalt on the crest of the ridge, and in Nubian sandstone in the south where rainfall is high.

At present there are gardens at Assar, Kunz, Ambasa, Kagera, Idd El Tin, Kanara and Serraf Al Ahmar. In the past there were others at Gedaref and Doka but pressure of population has increased the need for water for direct consumption and caused these to be abandoned. Irrigation is an extravagant means of using water and where the water is required for people or beasts irrigation ceases. All the gardens in the area allow people to take water from their wells in the dry season, and undertake to water stock if necessary, even if it means there is not enough water left for cultivation.

Gardens can be inherited or bought. They are normally owned as a sideline by a wealthy man, usually an Arab. He employs gardeners. Water is obtained by means of a saqia or, more commonly nowadays, a pump. The cultivated area of the garden seldom exceeds a third of an acre, the size being limited by the availability of water. It includes fruit trees and vegetables. It is doubtful if, with high capital and labour costs, gardening is profitable. Watering of stock is, however. Since the water is delivered at the surface by pump or saqia the gardener can charge a drawing fee. Each head of cattle pays ten to fifteen piastres a month, and most gardens water several hundred beasts throughout the dry season.

Figure 79 shows a sketch map of a garden in Assar. It is owned by a local Dubanya, who also has a tractor and a shop, although the garden is still watered by a saqia. His chief gardener is a Kassala man but he also employs part-time five French Africans from local villages. His only tree crop is limes. The rest of the garden is given over to onions, tomatoes, or green vegetables (fig.80). These salad vegetables take only forty days to mature and the first crop can be grown with little more than rain.

FIGURE 79 ASSAR. PLAN OF IRRIGATED GARDEN

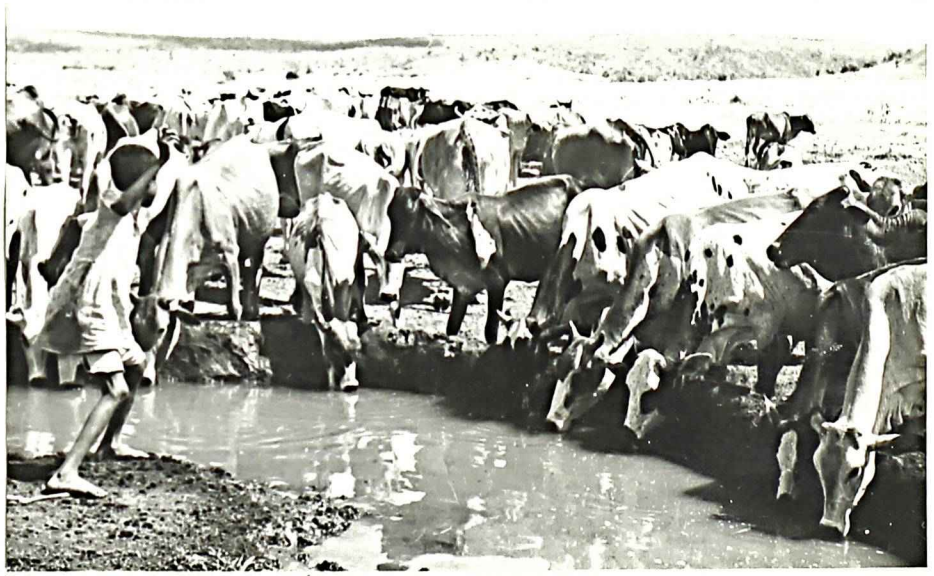


Another crop is then planted. By November, however, the green vegetable area is fallow as there is not enough water to irrigate the whole garden. Green vegetables require daily watering and are very extravagant in their use of water. Tomatoes are watered every two days. The rest of the garden is watered twice a week. Produce is sold at the nearest market, where it finds a ready sale, for vegetables are otherwise unobtainable in the dry season. The onions are a good steady cash crop. They store well and are bought both by the local people and by the migrating nomads.

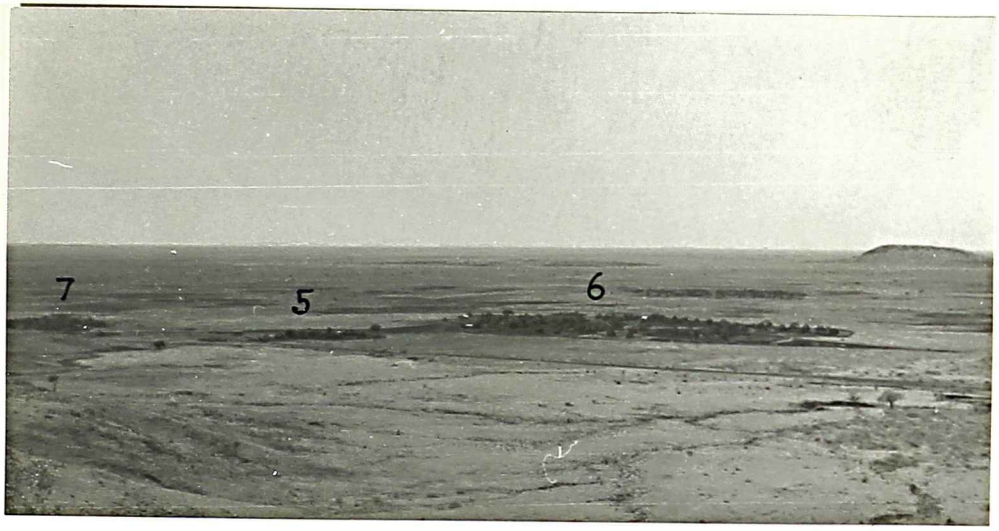
During the dry season most of the well water is used to water stock. Cattle from Assar, Kassala and Komshitta come regularly to this particular garden. The cattle are watered in a clay basin outside the fence surrounding the garden. The Beja herdsman and the assistant gardeners keep the beasts under control.

FIGURE 80 IRRIGATED GARDEN, ASSAR

Saqwia drawing water from well



Watering cattle with water from the garden



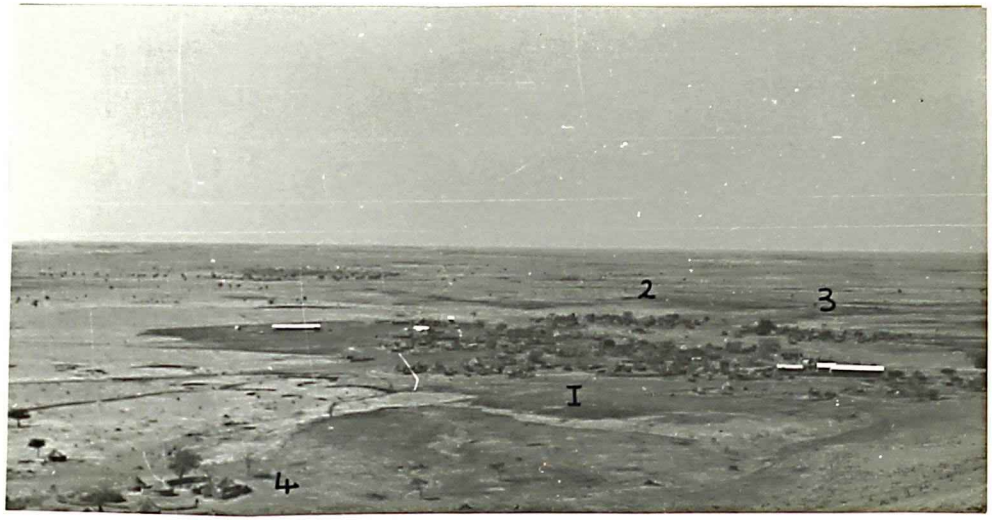


FIGURE 80 contd. ASSAR. (from the basalt ridge looking west).

1) Main village with schools, court and dispensary.
2) Main village Jaalin community.
3) Main village Murraba community.
4) Fulani camp.
5) Omda's house.
6) Omda's entourage.
7) Old Dubanya camp.

STUDIES OF VILLAGES ON THE GEDAREF RIDGE.

ASSAR

The Assar group of villages forms one of the most attractive settlements in the Ridge. It is situated at the foot of a magnificent range of wooded, flat-topped basalt hills, about twelve miles south of Gedaref. The centre of an omda, this was the biggest settlement studied. As a result of its administrative functions it offered a wider range of services than normally found. As villages are generally bigger and services more extensive in the southern part of the Ridge than elsewhere, it is fitting that the largest settlement studied should be from this area.

The settlement has a considerable history. It does not seem to have existed during the Fung, but in the 1820s it was developed as a large Turkish military base. Wells may, or may not, have existed before that for nomadic cattle, but it was the Turks who developed the water resources of the area. Tradition has it that they dug "ninety-nine wells, one in the compound of every officer's house." To judge from the scars left by wells which have fallen in there must have been a great number. There was a market

where Sudanese and Ethiopian goods were exchanged[1]. The Dubanya had a camp about half a mile from the main village where they paused on their migration south and where their chief could do business with the Turk. Encouraged to settle by the abundance of water and probably by official persuasion, Arabs gradually established villages round about (see figure 31).

Then came the Mahdia, from which neither Assar nor the neighbouring area have ever recovered. Only one of the nearby villages was restored by its Arab inhabitants, and another passed into the hands of Western Sudanese. The rest lie deserted. Assar is about a quarter its former size, and most of its wells have never been reopened.

The present main village is a compound settlement. (see fig,80), straddling the khor that provides Assar with its best well sites. To the south is the Dubanya quarter, which forms the largest part of the village. Members of minority tribal groups are housed within it. It contains the dispensary, court, boys' and girls' primary schools

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1 Werne, 1852(2): p.114.

and the mosque. The north side is divided into two fairly well defined tribal communities of Jaalin and Murraba. Each tribal group has its own sheikh but the Dubanya sheikh is head of the village. The Murraba are descendants of Tunisian mercenaries in the Turkish army. They include in their group the only remaining Turkish family. Because of their administrative ability and education, all the Copts, most of the Turks and many Murraba who used to live in Assar have left the village to enter government employment or business in the towns.

South of the main village is a very small group of cattle-owning Fulani. Half a mile further there are two compact villages on the site of the old Dubanya camp. This camp site became a settled village sixty-five years ago, when the Dubanya leader selected it, and Tomat on the Atbara, to form his headquarters. One village consists only of the omda, who is a relative of the Dubanya tribal leader, his family and entourage. The women of the village, in particular, are very dark because they are descended from household slaves. The other village is composed of ordinary tribesmen.

Each of the villages has its own shops, there being seven in all. Unlike most omda's headquarters Assar has no market. Cut off from the eastern villages of the Ridge

by a range of hills, it is not well placed to be a commercial centre, especially as it lies three quarters of a mile from the main road. Kassab market is only four miles away. Most shopping is, however, done in Gedaref, whose urban hinterland includes the whole Ridge. Assar has its own pale blue bus which goes into town every morning, returning after the market closes in the afternoon. The twelve mile journey costs 10 P.T. each way.

Assar is one of the best watered villages in the Ridge. It has ten wells of depths varying from 9-16 metres. Two serve the main village, one serves the Jaalin quarter, another the Fulani, another the Dubanya camps. There is one especially for cattle, and there are five privately-owned garden wells. The best are very close to the khor. The Fulani and the camp wells, despite being the deepest, cease to yield in the dry season. Although they are sited on the pediment they are far from the khor which concentrates run-off. The khor carries a great deal of water as it drains a large interior basin in the hills.

Assar, indeed, is one of the half-dozen or so places in the Ridge where there is enough well water to irrigate small gardens. The garden wells make Assar one of the

largest stock watering centres in the dry season. Cattle from over seven villages, as well as many passing nomadic herds, water regularly at Assar. Formal arrangements are made with the various owners of gardens, which water the stock. A certain village will always bring its animals to a particular garden at a specific time in order to avoid over-crowding and clases with other herds. Assar used to water stock from other villages, but since the building of a deep bore in the south several villages send their animals there as it is closer. Many of these villages begin taking their beasts to Assar as early as October, when their small hafirs dry up.

If water is plentiful at Assar, land is certainly scarce. Several neighbouring villages have been abandoned because yields were so low from overworked fields. Around Assar all possible land is cultivated; even the flat-topped hills behind the village are used for simsim, which is tolerant of stony soil. The majority of people, however, cultivate much further away in the Plains in order to obtain enough good land. Some have both far and near fields.(fig. 81). 17 per cent go as far as Gabob twenty to thirty miles away but nearly half go only to Abu Asal, which is eight

miles to the south east. Here a small hafir provides water. 5 per cent farm in neighbouring areas.

FIGURE 81.

ASSAR. CULTIVATED LANDS.

Percentage of villagers with fields in the following areas:-

Near Assar	28
Near Assar and in the Plains	10
In the Plains	52
Near neighbouring villages in the Ridge	5
Without fields	5

Those farming locally are usually those who are unable to go further afield. Either they are kept in Assar by other employment, or they lack transport animals, or they are old and weak. 5 per cent of the men have no farms. This is a very high figure for the District as a whole, but in view of the administrative and service functions of Assar it is understandable. Council employees such as watchmen and policemen, have little spare time for cultivation, especially where land is not available close to the village.

Despite the fact that over two-thirds of the villagers are involved in the extra work of cultivating distant fields, less than 20 per cent employ labour.

Even then half the employers have only two workers. Only 16 per cent of these families find it worthwhile to use labour on their small local fields, the other 84 per cent employ it on distant fields at Abu Asal Gabob or elsewhere.

Moreover, only about 20 per cent of the farmers use tractors. Yet there are three scheme-holders in the village with machinery for hire. The tractors are usually used on distant fields. It is seldom worthwhile using them on the scrappy pieces of ground around Assar. For an Arab village Assar has been slow in adapting to concepts of large-scale agriculture. A combination of local scarcity of land and distance from the M.C.P.S. may explain it. Agricultural production, however, varies considerably among Assar's three villages (fig.82). The omda's entourage have the most extensive fields and are the chief users of tractors. Although many farmers from the overcrowded main village have to cultivate elsewhere, a general lack of interest in agriculture is indicated by low employment figures for labour and machinery.

FIGURE 82.

ASSAR. SCALE OF AGRICULTURAL OPERATIONS.

Percentage of cultivators in the three villages:-

	Omda's Village.	Assar Main Village.	Old Dubanya Camp Village.
Cultivating distant fields in the Plains	79	66	56
Using machinery for cultivation	32	10	22
Employing labourers in their fields	14	16	36

With several notable exceptions, the peoples of Assar do not appear wealthy, as their dry season occupations indicate. (fig.83). Because they are Arabs in a council administered by Western Sudanese only 12 per cent have hashab, and some of the gum gardens are very small ones on the nearby hill. Owners are able to tap all their own trees. Other occupations reflect Assar's functions as an administrative centre. 9 per cent are employed either by the council, or by the Dubanya tribal authorities. There is also a variety of wage-earning jobs available in the villages. For example, the population is large enough to maintain the services of five water-carriers.

As with most Arabs, a high proportion, over 30 per

cent, have no specific dry-season occupation and are virtually idle. The most common occupation is typically Arab, involving, as it does, the handling of animals. Over 21 per cent have camels, which, along with some donkeys, are used for transporting goods for profit. A load of building material cut free in the forests of the south sells for 2-3 L.S. in Gedaref Town.

Although Assar is wholly Arab, by no means everyone has cattle, and most owners have only one or two. Beja herdsmen care for the beasts. As they are many, the cattle sleep in a camp on the hill outside the village. They are brought in for watering each noon, and thereafter go to their owner's houses for milking. Two men, each with over a hundred head of stock, employ their own private herdsmen. They are among the richest men in the village. One has a tractor, and a simsim factory as well; the other has a tractor, a shop and a bakery. Both are Murraba, which seems to be the most enterprising, as well as the oldest, group in the village. Certainly it is only among well-established communities in the District that such wealth is found.

FIGURE 83

ASSAR. DRY SEASON OCCUPATIONS

Number of villagers practising the following dry season occupations:-

Transport (camels)	51
Gum picking	29
Employed by council or tribal authorities	21
Casual labouring	22
Builders	13
Simsim factory	10
School teachers	10
Shop-keepers	8
Gardeners	8
Water carriers	5
Herdsmen	4
Craftsmen	3
Drivers	3
Unemployed	55
Total:	233

2) ABU NAGGA.

Abu Nagga lies seven miles south west of Gedaref just beyond the main line of the Ridge. In contrast to the Arab hill-foot settlement of Assar, Abu Nagga is one of the largest khor-sited settlements in the District. It has a typically mixed Western Sudanese and West African population. Consisting of seven villages, it comprises almost a complete omodia (fig.84). The three southern villages are situated on low stony rises either side of the khor. They are compact and separate. The main village straggles out along the khor. It has numerous tribal quarters under the authority of sheikhs from the two oldest communities. There are three other compact villages on the clay plains to the north west.

A study of the development of settlement at Abu Nagga shows the great attraction of permanent water supplies for the people of Gedaref District. Ample underground water supplies can be found in the bed of the khor throughout the year. Wells are only about ten metres deep. Three wells existed before the Mahdia, and their reliable water supplies acted as a powerful magnet to Arabs and their herds. There seems to have been some permanent settlement, probably consisting of a few local Arabs, and

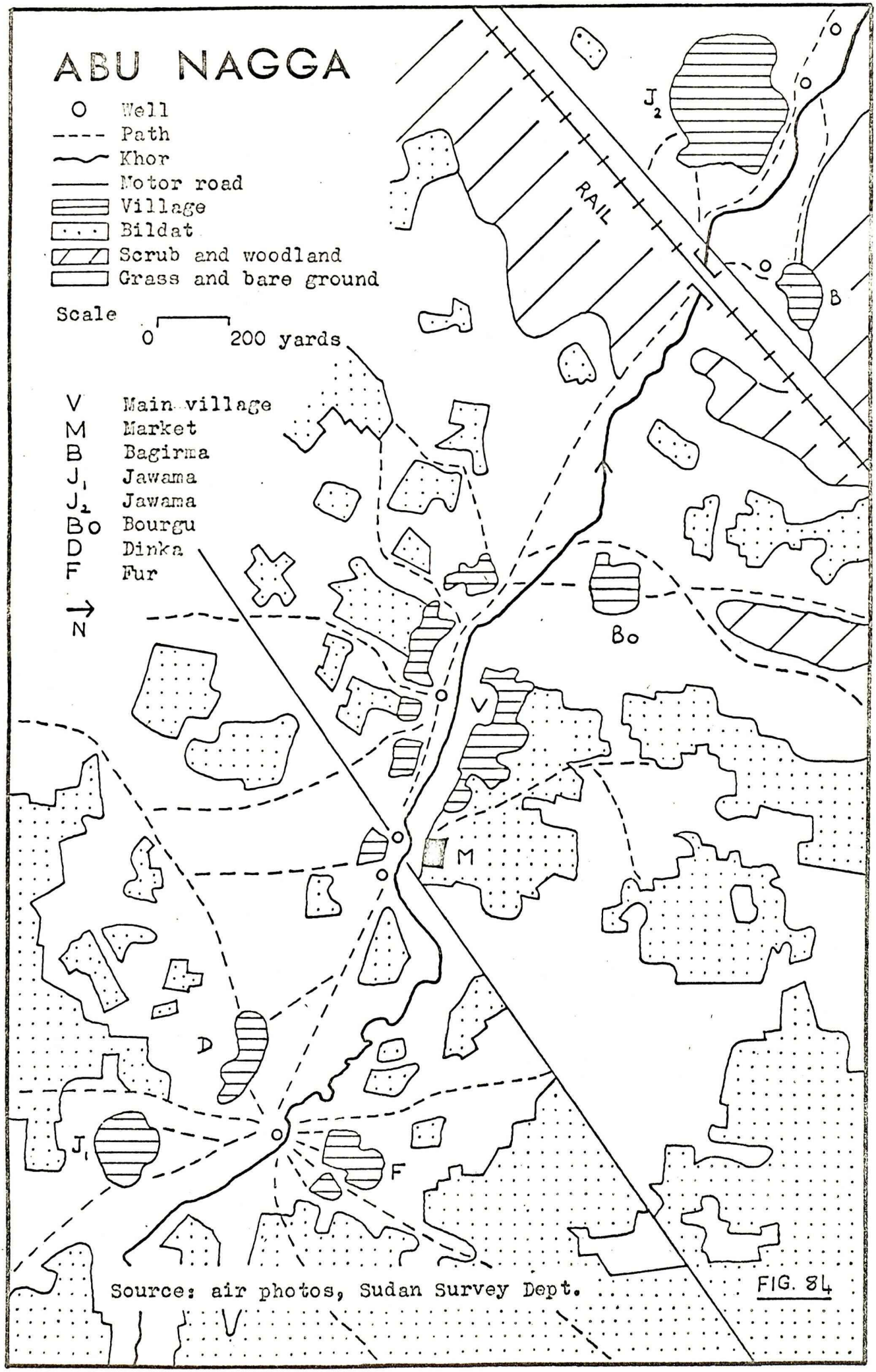
ABU NAGGA
O Well
Path
Khor
Motor road
Village
Bildat
Scrub and woodland
Grass and bare ground
Scale
0
200 yards
V Main village
M Market
B Bagirma
J1 Jawama
J2 Jawama
Bo Bourgu
D Dinka
F Fur
N
RAIL
J2
B
Bo
V
M
D
J1
F
Source: air photos, Sudan Survey Dept.

FIG. 84

some West African pilgrims, especially Kinan. After the Mahdia the Kinan returned. Groups of Mahdist soldiers, including Dinka and Nuba, were attracted to the wells. So too were other pilgrims and Western Sudanese immigrants. The main village of Abu Nagga has thus come to consist of a large mixture of peoples, Hausa, Kinan, Nuba and Western Sudanese, mostly Fur.

After the Mahdia, a Jawama village was formed at Geliem two miles south of the khor. A Fur village was formed one and a half miles north of the khor. Both these villages used a well in the khor as their source of water. About 1910, the Fur village moved to be closer to its water supplies. In 1927, after an attempt to dig a well locally had failed, the Jawama, too, moved near to the khor. These moves were the result of a desire for easier water supplies, which became increasingly important as living standards rose. They were facilitated by a decline in tribal suspicions, which had previously made communities of different origins reluctant to live close together.

In the late 1920s a group of Bagirma were encouraged by the prospect of good water, to settle to the north west of the main village. But both they and the older Jawama village were sited on flatter ground in deep clay. They have therefore had difficulty in obtaining water.

The Bagirma well is virtually useless, although it is over thirty metres deep, as it is foolishly sited on a small side khor. The people are forced to walk nearly a mile to the wells at the main village. The Jawama have to send their cattle to the bore at Muri for two months each year, whereas stock from the other villages are able to water at their own wells all the time. A mile or so to the north of the Bagirma village is the settlement of Um Talaulus, which is similarly situated on the clays. It is a Bourgu village with such an inadequate well that ten years ago part of the population moved to form a splinter settlement on the edge of Abu Nagga's main village. These people represent the latest group to be attracted by Abu Nagga's water supplies.

Considering its large population the Nagga group of villages have relatively few services. There is no dispensary, a sub-grade school was wrung from the council a couple of years ago, and the market which is held twice a week has fewer than half-a-dozen stalls. Undoubtedly the proximity of Gedaref hinders development here. An omda, who spends his time living in the Town, hardly helps the community obtain better services. Abu Nagga, however,

is by no means a suburb of Gedaref. With buses to town charging 5 P.T. each way, few can afford to commute to Gedaref. Those who work there in the dry season, and the proportion is less than in many villages further from the town, stay there during the week.

The eastern boundary of the M.C.P.S. lies close to Abu Magga. The village has lost harig land and some of its hashab with the coming of mechanization. The areas of bildat cultivated by the villagers have been consolidated to fit the scheme boundaries. The more concentrated cultivation which is the result of this has reduced the possibility of fallow. Considering the proximity of the M.C.P.S., it is strange that no one from Abu Magga owns or even appears to hire a tractor. The well-established and wealthier villages, however, still have enough land for it to be worth-while employing labour. Really large-scale employment of workers, such as is found among the richer Arabs in the Ridge, does not, however, occur.

With its mainly Western Sudanese population, Abu Magga provides certain contrasts with Arab villages in the Ridge. It contains within it a considerable variety of Western Sudanese tribes. There are Jawama, Arabs whose way of life is very like that of local Shukriya or

Dubanya. Then there are negroid people such as the Fur with very different characteristics. Some communities like Gelliem, where only four men were born outside the village, are old-established. Others, especially the main village, contain many recent arrivals.

These variations show in the dry season occupations undertaken by the villagers. The Jawama of Gelliem have a narrow range of jobs. Employment consists mainly of casual labouring or transporting forest produce by camel. A quarter of the villagers have these animals. This and the general lack of regular dry season occupations are characteristics typical of the local Arab villages. The newer Western Sudanese immigrants and the West Africans tend to be more fully employed in the dry season. With water supplies so easily obtainable, they can if they wish, undertake full-time work. This may be financially necessary as agricultural land around the village is now limited and profits from bildat cannot be very large.

Nearly all the Western Sudanese have been able to obtain hashab as they live in a council administered by a Western Sudanese nazir. This is in sharp contrast to the Arabs of Assar who have few gum gardens. Some West African Kinan have also been given hashab, because they have been in the area for so long. It is very rare for West Africans to be granted this privilege.

3) HASSAN.

The two settlements already described occupy sites with ample water near the highest part of the Ridge. Hassan, lying eleven miles north east of Gedaref Town, faces the plain of Gabob and is on the eastern margin of settlement.

The inhabitants of Hassan are Shukriya from Wad es Said, a pre-Mahdia village four miles closer to the main ridge. As Wad es Said and neighbouring settlements expanded, the surrounding land became severely over-cultivated. Its water supplies were not sufficiently good to compensate for low yields, for in the dry season additional water has to be fetched from the centre of the ridge. To obtain adequate land some people from Wad es Said began to cultivate at Hassan, carrying their water with them. In 1947, a successful well was dug at Hassan, and at once part of the village moved to be closer to its fields. They have been joined by a Fulani group, who settled three-quarters of a mile away and share Hassan's well.

The well is in an area where the thickness of the overlying clays impedes percolation. It is very inadequate in the dry season. Sited in a slight depression, it is 27 metres deep and a quarter of a mile from the village.

Even when water is plentiful a good deal of effort is needed to fetch it. Thus both men and animals use a hand-dug hafir until it dries in mid-December. This hafir is horseshoe-shaped. It receives part of its water from the low rise on which the village is situated, but most of its water comes from a khor flowing from the centre of the ridge. This khor flows four or five times a year, and, except in 1961, it has always flowed so violently that the hafir banks have been breached. The hafir, which already has a capacity of 4,200 cubic metres, could be considerably enlarged so as to hold water for a longer period.

After December the well is used, but its yield becomes very low in about six weeks. Camel owners fetch water from Serraf, seven miles away on the crest of the ridge. As the dry season progresses, an increasing number of the rich buy water from trucks. Starting at 25 P.T. for a 40 gallon drum, the price rises to 30 P.T. in April and May when water is really scarce. The main problem is not the expense, but the uncertainty of truck supplies. The truck will be diverted if more profitable loads are offering. The poor have three possible courses of action. A few move into Gedaref Town for the dry season. Some walk to Wad es Said where they and the poor from that village share the meagre yield of the well. Others continue

to use the well at Hassan, although they may have to wait beside it all night in order to tap the recharge as it trickles into the bottom.

Goats are watered in the village throughout the year. Although 80 per cent of families keep these animals scarcity of water restricts their numbers. They are used to provide milk in the dry season when yields from cattle are low because they are walking so far between their grazing grounds and water.

The people of Hassan are vocal in their complaints about lack of water. In older villages, traditionally accustomed to shortage, complaints are less noticeable. Hassan is a wealthy village and its settlers, with an otherwise high standard of living, find the scarcity of water particularly irksome. A village of considerable agricultural efficiency, the irregularities and difficulties of dry season water supplies are very irritating.

The people of Hassan have chosen to put up with inadequate water in exchange for ample land. As in other villages on the edge of the Ridge they cultivate extremely large areas with the aid of mechanization and hired labour. (fig.85). A tractor normally cultivates five feddans an hour. At this rate, it seems that over-three-quarters of the villages are cultivating more than fifty feddans,

FIGURE 85.

HASSAN. USE OF TRACTORS.

Hours	Number of villagers using tractors for this amount of time:-
1	0
2	0
3	1
4	2
5	2
6	1
7	1
8	5
9	2
10	9
11-15	10
16-20	9
21-30	7
31-40	5
41-50	1
Total:	55

FIGURE 86.

HASSAN. EMPLOYMENT OF AGRICULTURAL LABOURERS.

Number of Labourers.	Number of families employing them,
0	3
1	2
2	10
3	1
4	4
5	3
6	3
7	3
8	1
9	2
10	15
11-15	2
16-20	4
21-30	2
Total:	55

compared with an average of six feddans for the whole Gedaref area. Farmers appear to be very wealthy for they are able to pay cash for the hire of machinery at the beginning of the rains, when money is generally in short supply. Tractors cost 1.15 L.S. to 1.75 L.S. per hour. Thus 75 per cent of the villagers are paying out over 12.5 L.S. for the hire of machinery, and four are spending over 50 L.S.

The hiring of machinery is accompanied by equally heavy employment of labour. It appears that the land cultivated by a tractor in two hours (approximately ten feddans) requires one labourer to clean, weed and harvest it. Thus nearly half the farmers employ at least ten men. Only twenty families have five or fewer and only three have none. (fig.86). Labourers are seldom employed singly, for as they live and sleep out in the fields, it is found that they work better with company. When agricultural operations are on this scale, it is doubtful if the heads of families do more than supervise.

The number of animals kept by the people of Hassan also indicates considerable capital investment. Over 65 per cent have cows, and all but four families have either camels or donkeys[2]. The villagers say that it is necessary

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2 (These figures may be compared with those for Kaboros, an old-established village of Western Sudanese negroes where only 12 per cent had cattle and 33 per cent had camels or donkeys).

to have a transport animal in order to fetch water, but the large number of cattle and camels kept suggest that there is still considerable love of stock of this kind for its own sake.

The cattle are among those making the widest type of migration in the area. They pass the rains in Butana away from the flies, then move to the Atbara, returning to Hassan after harvest. When Hassan's hafir runs dry, they travel to Serraf, where they drink every other day. About the end of April, if grazing runs short, most of the herd is sent to the R.Atbara again until the rains. A few of the best milk animals stay behind in the village. The long walk to the west of the ridge for water is very tiring for the cattle but they cannot stay at Serraf because there is no grazing left around the water-points of the central Ridge.

The villagers do not undertake many specific dry season occupations. Only one person, the sheikh's brother, has hashab. There are four shops, including a bakery. (Bread is a luxury commodity found only in the larger villages or where living standards are exceptionally high). The sheikh's brother is the only one to have business in Gedaref Town. Those with camels use them occasionally for transporting goods. There are the usual few, who have reputations as skilled builders and charge for their

services. Most people, however, say that they are too busy fetching water to do other work, but like most Arabs they lack the inclination to labour. Moreover, their agricultural activities are sufficiently profitable to enable them to do nothing for the rest of the year.

4) UM KHANJAR.

Like Hassan, Um Khanjar is an Arab village on the edge of the Ridge. Lying to the north west of Gedaref, it is one of five villages in the north to be built on Nubian sandstone rather than basalt. Its water supply problems are thus rather different from those of the other two environments.

The village is built on a gentle flat-topped rise of azaza, overlying Nubian sandstone. To the south lies a long, low hill, its margins pitted by several groups of gallits. The gallits were probably originally made and used by nomads. However, the four groups nearest to Um Khanjar were used by the villagers until about thirty-five years ago. Taken together, they must have held a considerable amount of water, for the largest, which was banked up on the downslope side, had a capacity of over 4,000 cubic metres. Today, however, two of these groups of gallits are completely filled with silt. Of the other two groups, only one is properly maintained and fully utilized. The gallits that went out of service first were those which lacked catchments and had to be laboriously filled by hand from nearby hafirs. The remaining gallits are all more than half a mile from the village and only one holds water until October. Thus this method of con-

serving water is of historical interest rather than an important source of present day water supplies.

In the course of its history the village of Um Khanjar has moved several times in response to changes in the water supply situation. When it was first founded it lay two miles to the north, where the village of Um Khanjar Donkey[3] now stands. Before the Mahdia there was a large hafir here. The village probably began as the rainy season camp of a group of Shukriya nomads, who could cultivate here on the southern edge of Butana while their beasts drank at the hafir or nearby gallits. When a well was dug at Um Khanjar seventy years ago, it provided permanent water supplies, so that at least part of the population could be settled throughout the year if it wished. Some doubtless continued to lead a semi-nomadic life with their cattle, until after the Mahdia. Then, with the general loss of animals, cultivation probably became more important than herding. The remains of the old nomadic movements can be seen today. During the rains the cattle still spend several months in Butana, although the firm azaza soil and lack of vegetation make Um Khanjar

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/3("Donkey" is the local name for a deep bore).

a remarkably healthy environment for stock. In the northern part of Gedaref generally, as in this village, the transition from nomadism to permanent settlement has occurred gradually and painlessly.

In about 1925 the village moved to its present site. It is now close to the well, which provides dry season water supplies for the human population. It is also two miles nearer to Idd el Tin, the large well-field in the main basalt ridge, where Um Khanjar's cattle used to water in the dry season. The beasts drank at the gallits in the rains. Then they drank at the nearby hafir of Azaza. (The old hafir to the north was by then silted, leaking and useless). Finally they walked nearly eight miles to Idd el Tin. Here they jostled with beasts from many other villages, all of which required water. Meanwhile men and goats drank from a khor in the rains, and "scraped along" with scant supplies of well water in the dry season.

In 1945 a deep bore was sunk at the site of the old village. Part of Um Khanjar, especially those whose fields lay to the north, took advantage of the new, ample water supplies to move back. In 1950, after a quarrel, a splinter group broke off from Um Khanjar, and set up the new village of Wad el Tom a mile away. Without their own water sources Wad el Tom's people continued, somewhat shamefacedly, to

use Um Khanjar's well and later its hafir.

Um Khanjar's hafir was hand-dug by Gedaref North Rural Council in 1953. Both the size of catchment and the depth of clay here were insufficient for the central government to provide a mechanized hafir. The hafir is horseshoe-shaped and receives run-off from the low sandstone hill. It has a maximum depth (including banks) of 3 metres and a total capacity of about 4,750 cubic metres. Evaporation from such a shallow hafir is so high that water lasts only until mid-October. Thereafter Um Khanjar's cattle travel either to the bore at Um Khanjar Donkey or to the five-year-old bore at Um Gulja, seven miles to the south-west. Especially towards the end of the dry season, the Um Khanjar bore, which is the most northerly source of permanent water in the area, is much in demand by nomads. Not only is crushing around the bore very great, but the bore itself may run short of water. Even the cattle from the bore's own village may prefer to water at Um Gulja. Only in one year were Um Khanjar's cattle able to water here throughout the dry season.

Despite recent losses of population, the number of people using Um Khanjar's well has increased considerably in the last thirty-five years. The original Shukriya were joined by a minority group of Ricabin from North Butana.

About twenty years ago several Bornu arrived. They were followed a couple of years later by large numbers of Hausa, who now comprise about half the village. Despite the fact that the composition of the West African group is continually changing as pilgrims move on, the Arabs and Hausa appear to live together in considerable harmony. This West African-Arab combination is the most common form of tribal mixing found in the North of the Ridge.

With this pressure of population on a single well in an area where rainfall is only about 450 mms, it is not surprising that water begins to run short in March. Supplementary water supplies are fetched from Um Khanjar Donkey and Um Gulja. Water costs 2 P.T. for four gallons if fetched by beast and 2½ P.T. if fetched by truck. The poor continue to use the well, but goats are sent off to one of the two bores.

In 1955 an attempt was made to improve percolation around the well. The khor flowing close to the well was diverted into a pool about thirty metres in diameter and extending to within a few metres of the well-head. The standing water in the pool then percolated downwards into the well. In 1961 a new well was dug close to the hafir. It was designed to tap water seeping through the rather

sandy base of the hafir. These efforts to improve Um Khanjar's water supplies were carried out by Gedaref North Rural Council. They show the extent to which local government authorities are assuming responsibilities for improving rural water supplies.

The treeless lands of the north are easily cleared. Cultivation, however, is not as extensive as at Hassan. There is only one tractor and a farmer is considered rich if he employs as many as ten labourers. The boundaries of the M.C.P.S., limit the directions in which agricultural expansion can take place. Situated in the far north east, Um Khanjar is the driest village studied. Except in years of very heavy rainfall simsim gives poor yields and farmers have to rely on dura. There is no hashab as the rainfall is inadequate for it to grow on clay soils.

Despite the lack of this dry season source of profit the village seems prosperous. It has three shops and two trucks. The council has sufficient confidence in the village's water supplies to have established both a dispensary and a co-educational school. Despite the fact that the road runs through deserted country, with little chance of picking up extra passengers en route, the trucks make the daily return journey to Gedaref, charging only 10 P.T. each way. That Um Khanjar, on the very margins of the Ridge, should have regular daily transport into Town gives

some indication of the influence of Gedaref over the surrounding villages.

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CHAPTER VIII.

THE CLAY PLAINS.

The use of mechanically-excavated hafirs in the last fifteen years has not only revolutionized land use in Gedaref District but has enabled a spread of population out into the clay plain. Immigrants living in the plains beside the new hafirs are in an environment very different from that of villages in the traditional areas of settlement. Some settlers have cleared the forest to form their villages. Other settlements were established within the area of the Mechanical Crop Production Schemes.

Before these villages are discussed in greater detail, the special characteristics of mechanized hafirs as sources of water supply are considered.

MECHANICALLY-EXCAVATED HAFIRS.

In appraising the changes in the water situation brought about by the establishment of mechanized hafirs it is relevent to consider how they differ from hand-dug ones. (see fig.26).

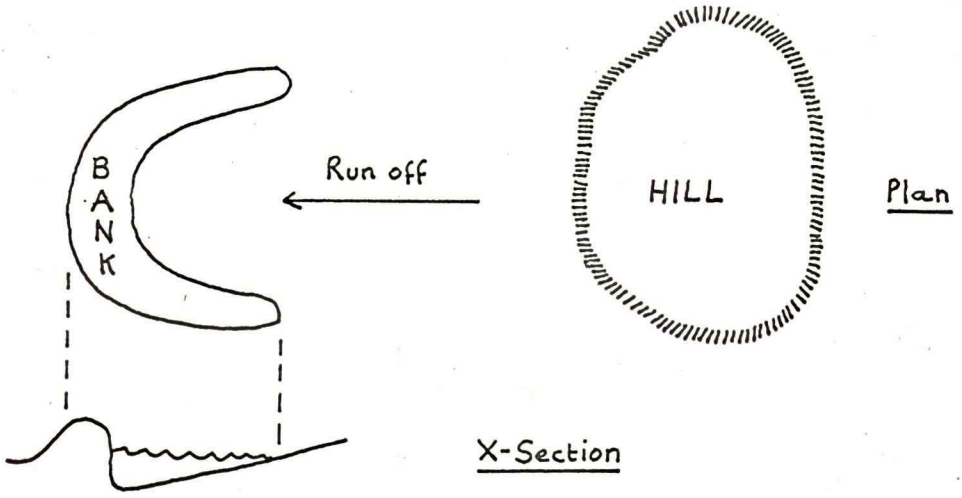
The use of machinery to construct feeder canals has

enormously increased the areas in which it is possible to construct hafirs. A hafir can now be sited at some distance from a hill, making it possible to obtain sufficient depth of clay. Run-off from the hill can be led into it by canal. Canalization has enabled some of the larger khors to flow further out into the plain. Thus hafirs can be sited far out into the clays, opening up new areas for settlement and cultivation. Where a hill catchment is small, the hill can be surrounded by a circular canal which feeds into the hafir, thereby making it possible to utilize a higher proportion of the run-off.

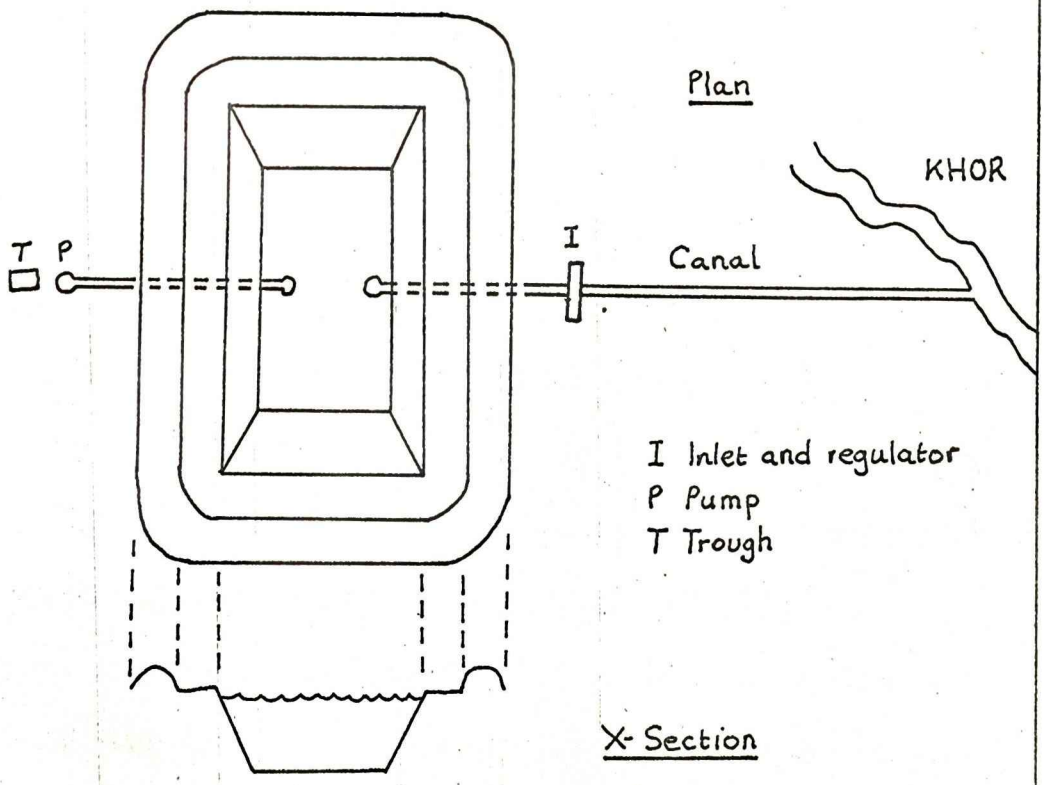
Mechanized hafirs are considerably larger than hand-dug ones (fig.87). They are usually designed to hold 10,000 - 20,000 cubic metres of water, whereas the average capacity of hand-dug hafirs in Gedaref was only 3.088 cubic metres. Moreover, losses from evaporation are much heavier from hand-dug hafirs than from mechanically-excavated ones. Mechanized hafirs, normally at least 6 metres deep, have as small a ratio of surface area to total capacity as construction requirements permit. (The long sides have slopes of 1:1, the ends of 1:3). Even so, evaporation from a 10,000 cubic metre hafir may amount to nearly half its capacity. Most hand-dug hafirs are horse-shoe shaped and the floor is sloping. There is

FIGURE 87 PLANS OF HAFIRS

1) Hand dug hafir



2) Mechanically excavated hafir



(neither hafir to scale)

always a large shallow area at the inlet end. The average depth of hand-dug hafirs in Gedaref, measured at the centre, was only 3.2 metres. In many cases over two-thirds of the water is lost by evaporation.

Because of the difference in their capacities and length of time during which they supply water, mechanized and hand-dug hafirs are used for very different purposes. Basically, hand-dug hafirs are used as a supplementary source of water supply for hill-sited settlements. They provide an easy way of watering beasts during the first months of the dry season, when men are busy in the fields. They fill only if sited close to the hill, where the clay mantle is normally thin. They are therefore shallow and liable to leak. Mechanized hafirs, however, often form the sole source of water supply for villages in the plains. (Indeed, as a supplementary source of water for hill villages they are seldom satisfactory as they have to be sited far from the hill in order to obtain a sufficient depth of clay.) Some of them have been specifically designed as foci for new permanent villages. Others, originally intended merely to facilitate cultivation or gum picking, have also attracted settlements. Mechanized hafirs now form the main source of water supply for 29 per cent of the villages in the area. Before the coming of techniques of mechanical excavation, Matna was the only

village dependent on hafirs for most of its water, and its supplies were supplemented by water brought in by the railway.

Because they are so often the sole source of water supply for a village, it is more important that mechanized hafirs should fill than hand-dug ones. In practice the reverse occurs. Hand-dug hafirs, fed by direct run-off from a hill, nearly always fill even when rains are bad. The khors that fill plain-sited mechanized hafirs may not flow at all if rain storms are not sufficiently heavy. Or they may flow briefly only once or twice. Thus in 1961, when rains were bad, out of a sample of twenty-five hafirs, three failed to fill at all. Five were less than half-filled and were dry by March. Only thirteen held water until the next rains.

Although nothing can be done to fill a mechanized hafir if the rains fail and the khor does not flow, its ability to fill and its capacity can be assisted by regular maintenance. Hand-dug hafirs, simple in design, require little maintenance. De-silting can be done by hand by the local villagers. If neglected, the hafir will merely dry a few weeks sooner than before, and animals will

FIGURE 88 MECHANICALLY EXCAVATED HAFIRS
COMPLEX REPAIR PROBLEMS

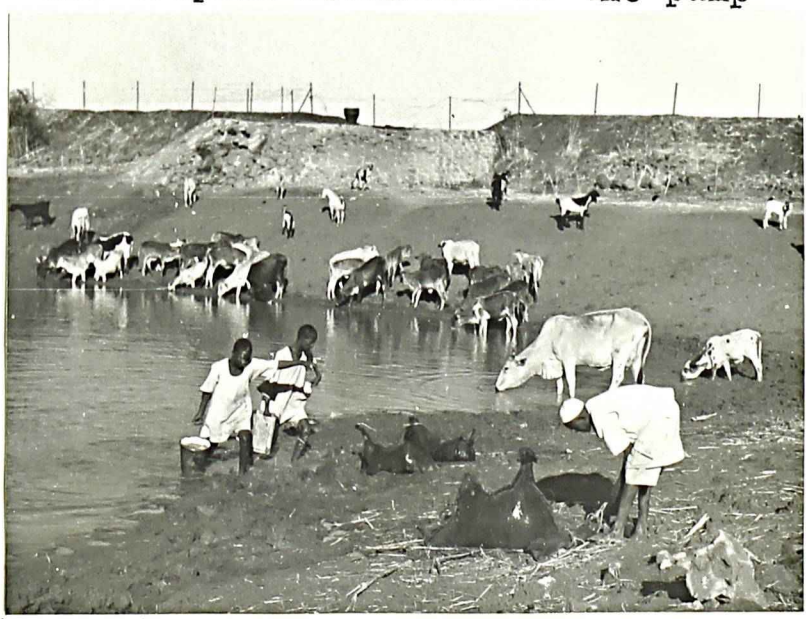
The empty hafir showing easily blocked inlet and outlet pipes

Frail fencing and thin pipes leading to animal troughs can be broken down by thirsty stock

FIGURE 88 Cont'd

Concrete inlet and regulator can be damaged by flash floods

The complex mechanism of the pump



A pump has broken. Men and animals take water directly from the hafir. The water is dirtied and the hafir banks damaged.

move to their dry-season water-points earlier than usual. Failure to maintain the complex inlet mechanism and canal system of a mechanized hafir can result in its not filling. Should its capacity be reduced by even 50 cms. of silt, the village using it may have to go elsewhere for water for almost a month at the end of the dry season, although the hafir had previously supported it all year. Yet, judging from reports of Gedaref hafirs, it takes only a few years for this amount of silt to accumulate in many cases. Not only is maintenance of mechanized hafirs required more frequently, but it is more difficult to achieve (fig.88). The work has to be carried out by travelling teams of technicians from the Department of Land Use and Rural Water Development, and they are badly overworked. Inlets, pumps and regulators require spare parts imported from abroad. The hafirs are sited far out in the plains and considerable time is spent in travelling to them. The transport costs involved in maintenance are very high as figure 89 shows.

FIGURE 89. BREAKDOWN OF COSTS OF MAINTAINING MECHANICALLY-EXCAVATED HAFIRS IN GEDAREF DISTRICT.

Rural Council.	Percentage of total costs incurred on:-		
	Materials	Labour	Transport
Qala'en Nahl	10	44	46
Gedaref South	18	47	35
Gedaref North	13	38	49

Note. Average annual maintenance costs per hafir were 91 L.S. Costs were higher in Gedaref North Rural Council, where distances between hafirs were greatest.

Source. From information in government files, Administrative offices, Gedaref.

As a result many mechanized hafirs in Gedaref District are inadequately maintained. The people settled about them cannot rely on permanent water. There are considerable variations in water supplies from year to year which force villagers to adopt a very flexible way of life.

HAFIR VILLAGES OUTSIDE THE M.C.P.S.

The villages which have been established beside mechanized hafirs are very different both in physical environment and in population from those found in the traditional areas. Villages near the new khor-fed hafirs in the virgin plain are built on clay soil, not on sand or silt. In the rains the village is knee-deep in a glutinous mud which makes movement within the village difficult.

During this period, it is hard to keep the village area clear of vegetation and there may therefore be many insects. The villages are situated on flat ground and are often surrounded by thick secondry bush. It is usually oppressively hot and airless during the dry season, when the slightly raised hill-foot villages have the benefits of breeze. The hafirs themselves, with their exposed surfaces ,are not hygienic sources of water supply compared with wells.

Most of the hafir villages in the clay plains are remote from other settlements. They are usually too isolated to make use of the government services, such as schools and dispensaries, which are sited in areas of denser settlement. Out of all the hafir villages only Um Bileil and Ghadambaliya the M.C.P.S. have shown themselves sufficiently large and stable for the government to feel it was worthwhile giving them certain basic services. Many hafir villages are on roads which receive no regular traffic. Even where there is a reliable truck service, it will stop with the first rains because of the glutinous quality of the clay soils. For up to four months, contact with the outside world is on foot or on camel. Where a truck service runs in a hill area, soils along the route

may be sufficiently sandy to allow a skeleton service to operate, except during the worst rains, and the number of villages concerned may make it financially worthwhile. Shops in hafir villages stock only goods of an imperishable nature[1] and there are frequent shortages of basic commodities such as sugar or cigarettes.

POPULATION AND SETTLEMENT.

Because of the isolation and unpleasantness of their sites hafirs do not attract the most stable and conventional members of society. Hafir villages are settled by pioneers who are prepared to accept discomfort and the hard work of clearing the surrounding bush. In exchange they receive virgin land for cultivation - as much as they like with fields lying within a few minutes walk of the village. There is plenty of timber for building and fuel close at hand. It can be cut and taken for sale in the dry season. These assets are not available in the over-cultivated traditional areas of settlement.

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1 (Common goods stocked by village shops include tea, coffee, salt, sugar, pepper, onions, tins of tomato puree, tins of milk powder, torch batteries, cotton cloth, gym shoes, and embroidery thread.)

Most of the pioneers are single men. They are attracted by the prospect of making large profits from agriculture. They include young Sudanese from the west who prefer farming in their own right to labouring for others, and who hope to return home in two or three years. There are the chronic wanderers who are prepared to "try-out" the new environment. Where water supply of the hafir seems fairly reliable West African pilgrims will settle with their families.

Many of the settlers, and certainly most of the first arrivals, lived in Gedaref District before coming to the hafir. The hafir sites are particularly attractive to people who have been squatting in or around Gedaref Town unable to find good land locally. New hafirs undoubtedly made possible some spread of population from the crowded Ridge and the Nahl Hills. Very few Arab settlers have been attracted to hafir villages, perhaps because all but two are located in the Western Sudanese councils. Moreover, one suspects that the well-established Arabs are reluctant to abandon their positions to mix in an ill-organized community with people whom they despise. Only three out of all the Plain villages contain Arabs, eight contain West Africans and twenty eight, or the great

majority, contain Western Sudanese. Because Western Sudanese have such a weak sense of tribe all but six of their villages contain members of several tribes. Four single-tribe villages are Arab or West African. (fig.90.)

FIGURE 90. ALL PLAIN VILLAGES. GROUP COMPOSITION OF VILLAGES.

Number of villages containing:-	
local Arabs only	2
Western Sudanese only	21
West Africans only	2
Arabs and Western Sudanese	1
Arabs and West Africans	0
Western Sudanese and West Africans	6
All groups	0
Total	32

Note. This figure refers to villages both within and outside the M.C.P.S.

Most immigrants arrive at the hafir village with few possessions except their tools. They set up a rough shelter, and let it suffice them while they prepare for their first agricultural season. Standards of life are very low. The single men who form the bulk of the population are not prepared to pay attention to house-keeping at the end of a day's work in the fields. Much

of the population is trying to save money. Animals are not common. Migrants do not usually arrive encumbered with beasts, and although many eventually acquire goats, the mud and flies may make the area unhealthy for stock. This is particularly true of the more southern hafir villages, where, in addition, the coarse perennial grasses are not very palatable in the dry season. 40 per cent of all villages in the Plains have no cattle. None of those in the pioneer areas outside the M.C.P.S. have them.

Buildings in hafir villages are for the most part hastily constructed and ill-maintained. Because of the absence of sand and silt, there is no suitable daub for lining the grass walls of houses to make them more permanent and waterproof. At the end of the rains in particular these villages present a most bedraggled appearance. The tattered straw of the previous year's thatch is almost undistinguishable from the yellowing grass that grows high between the houses. Because the settlers come from many tribes, and each tribe prefers to live a little way apart from the others, the houses are dispersed and scattered,

so that the village has a very irregular shape.

WATER SUPPLY AND MIGRATION.

Because of their isolation these villages are completely dependent on the hafir for water. Should the hafir dry out unexpectedly, no other water-point is usually available within walking distance. This means that the hafir dwellers either have to pay the exorbitant prices demanded by a commercial truck for carrying water, or undertake a hurried emigration to friends or relatives elsewhere until the next rainy season. Since, as we have noticed, khor-fed hafirs are particularly liable to fail to fill during a dry year, the rhythm of life at a hafir village is uncertain.

Some hafirs now regularly fail to provide enough water for their villages throughout the year. A hafir which fills regularly acts as a strong magnet to settlers and the villages beside them grow. Meanwhile the capacity of the hafir may be reduced by silting. Thus, after the initial few years the population may have to leave its village for part of the dry season each year. (Only in the original part of the M.C.P.S. where water-points are closer together, can water be fetched daily). (fig.91)

FIGURE 91. ALL PLAIN VILLAGES. WAYS OF LIFE.

Percentage of villages practising the following ways of life:-

Fully settled	52
Making local movements to obtain water in the dry season	36
Transhumant	12
	100

This dry season migration is not an organized village movement like the transhumance of the people from the Nahl Hills. The whole village does not move together to a particular dry season camp. Since most settlers are interested in making money, many of them, particularly the pilgrims, go to Gezira to pick cotton. They travel by truck and rail, often a large number of families from the same village going together. Others will find profitable employment in Gedaref Town. A few will merely visit relatives for several months.

While lack of water enforces the total evacuation of four hafir villages for several months each year, many settlers from other villages go off voluntarily to earn money. With few possessions and animals, and no rights to nearby gum gardens, the villagers are very free tp go in search of profitable employment elsewhere. Thus, the populations of many hafir villages are much reduced

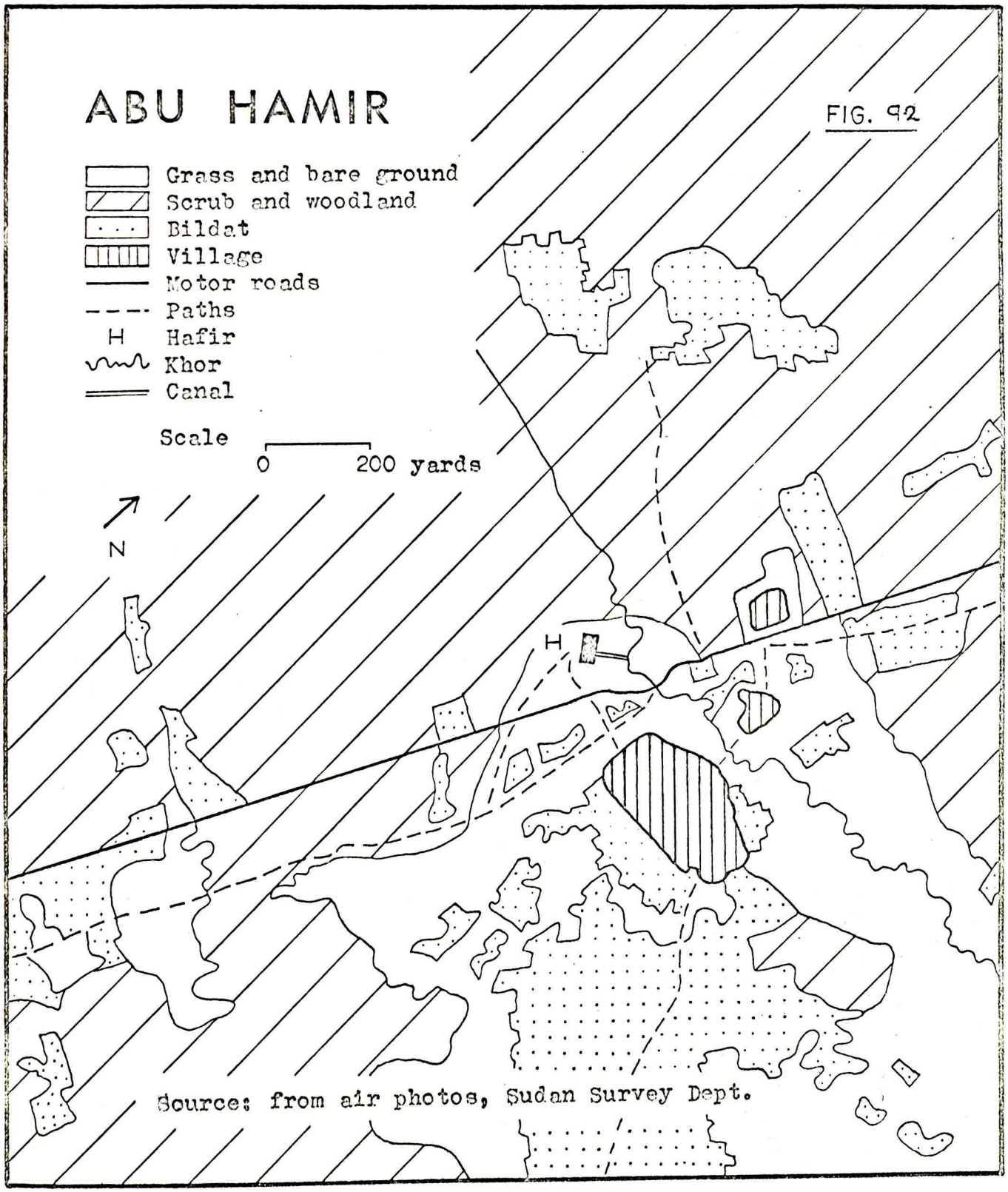
voluntarily in the dry season, so that the water, which might otherwise have run short, is adequate for the remainder of the village.

STUDY OF A HAFIR VILLAGE OUTSIDE THE M.C.P.S.

ABU HAMIR.

Abu Hamir is a caricature of a hafir village. Its population is of incredibly mixed tribal origins. Pious pilgrims jostle with ne'er-do-wells, chronic wanderers and callow Western Sudanese youths. In the rains the ill-constructed huts of the pioneers are hidden by the long grass, which obliterates even the main path to the hafir.

Abu Hamir lies on the clays between the granite hills of Ban and the serpentine ranges of Qala' en Nahl (fig.92). The hafir was dug during the dry season of 1958 in the hope that it would enable this area of the plain to be utilized. Several years previously people from the overcrowded areas of Ban, Qala'en Nahl and Abu Ranga had begun farming here, carrying their water with them. As soon as digging began, these families and other prospective settlers moved in, and squatted by the excavations. The first year the village was small, for the hafir was still untried. Only settlers willing to risk its filling came. Subsequent years have proved the ability of the hafir to fill and to hold water throughout the year. The khor feeding it flows regularly, and even in 1961 when most other hafirs in the area failed hafir


ABU HAMIR
FIG. 92
Grass and bare ground
Scrub and woodland
Bildat
Village
Motor roads
Paths
H Hafir
Khor
Canal
Scale
0 200 yards
N
H
Source: from air photos, Sudan Survey Dept.

Abu Hamir filled to the brim. As its reliability has been demonstrated, there has been a steady inflow of new settlers.

Over 60 per cent of the villagers, including most of the first pioneers, came from Gedaref District (fig.93). Of these, nearly two-thirds came from the villages in the surrounding Hills. People here knew as soon as the hafir was being built. They could move to the new site without severing connections with their old villages. If the new life proved unsatisfactory they could always return to their old homes. Most of the migrants were attracted by the prospect of new farm-land and ample water-supplies. Some, however, moved for tribal reasons. Abu Hamir acquired a reputation as a centre for people from French Darfur. especially Roma. People from this area, previously scattered in tribally-mixed villages throughout Gedaref, have moved to Abu Hamir to join fellow tribesmen.

As the hafir became widely known it attracted an increasing number of immigrants from the west, who were looking for farms in the area. There is a large group from Darfur. 14 per cent of the present villagers have come from beyond Sudan and have made this their first halt.

Indeed, Abu Hamir draws its population from the whole

FIGURE 93. ABU HAMIR. AREAS FROM WHICH SETTLERS CAME.

Areas	Number of adult men.
West of Nigeria	4
Nigeria	1
Chad	5
Darfur	10
Kordofan	4
Blue Nile	11
Khartoum	5
River Rahad	9
Qala'en Nahl	20
Ban	11
Rest of the Nahl Hills	12
Gedaref Town	10
Rest of the Gedaref Ridge	14
River Atbara	4
Kassala District	7
Eritrea	2
Total:	129

Note. Eleven men omitted from survey.

savanna zone of Africa. There are settlers from Eritrea in the east and Senegal in the west. The total population of about a hundred and fifty families includes representatives of at least twenty-two different tribes. Bourgu, most of whom come from Darfur, form 28 per cent of the population. Roma from Chad form 12½ per cent. Other tribal groups are small, and indeed tribes are represented by only a single family each. (fig.94).

Many of the families say that they were attracted to Abu Hamir by the presence of "brothers". The word "brother" here should not be taken literally, but rather as meaning any relative or even a fellow tribesman from the same home district, with whom the family feels bonds of interdependence. 38 per cent of the villagers had kin of this sort in the village. An additional 17 per cent of the immigrants had been attracted to the area generally by the presence of relatives in Gedaref District.

Although over half the villagers now have links of this sort in Gedaref, only 10 per cent were born in the Province (fig.95.). 38 per cent came from the far western province of Darfur, and 45 per cent were foreigners from

FIGURE 94. ABU HAMIR. TRIBAL STRUCTURE OF POPULATION.

Tribe	Number of adult men who are members of these tribes.		
Bourgu	39	Hausa	4
Roma	17	Beni Halba	4
Miseri	13	Merarit	3
Senegalese	9	Sulihabi	3
Masalit	8	Rashid	3
Fur	8	Kimi	2
Salamat	8	Taisha	2
Hosami	8	Tama	2
		Fulani	2

Plus five tribes represented by only a single man.

Total: 140

FIGURE 95. ABU HAMIR. SETTLERS BY PLACE OF BIRTH.

Areas	Number of adult men born in those areas.
West of Nigeria	4
Nigeria	9
Chad	51
Darfur	48
Kordofan	9
Blue Nile	3
Khartoum	2
Gedaref District	12
Kassala District	2
Eritrea	0
Total:	140

West Africa.[2] These figures give some idea of the attraction of hafir villages to first-generation immigrants who have not put down roots in any particular place.

Indeed, many of the settlers at Abu Hamir show a remarkable inability to settle down. Wanderlust has already seized some of the most restless inhabitants and they have left the village after only a couple of years. Nearly half the population admit to spending an average of less than five years at their previous stopping places. (fig.96). Many of the chronic wanderers have been moving around for years. A quarter of the householders had been away from their birthplace for over twenty years. (fig.97). Over 30 per cent of the population, however, left home less than five years ago. These are mainly young men, whether pilgrims or Western Sudanese, who, unencumbered as yet by dependents, are anxious to make as much money as possible, even if it means living under pioneer conditions in a virgin area.

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[2]This does not mean that 45 per cent of the villagers are pilgrims. 85 per cent of the West Africans come from eastern Chad. Many belong to the same tribes as those across the border in Sudanese Darfur, and few want to go to Mecca. Even among those from further west, some have been wandering for so long that they seem to have lost their original intention of completing the pilgrimage. Many of the younger West Africans, however, still hope to see Mecca.

FIGURE 96. ABU HAMIR. AVERAGE TIME SPENT BY SETTLERS AT PREVIOUS VILLAGES.

Time in years.	Percentage of settlers halting for this amount of time.
1	13
2	12
3	8
4	4
5	9
6-10	15
11-15	10
16-20	5
over 20	8
Born in previous village	16
Total:	100

FIGURE 97. ABU HAMIR. SETTLERS BY TIME AWAY FROM HOME.

Years since they left home.	Number of settlers.
1	2
2	6
3	9
4	12
5	13
6-10	28
11-15	11
16-20	12
over 20	33
Born in the province	14
Total:	140

55 per cent of the villagers are unmarried, the rough life at Abu Hamir being scarcely likely to attract settled family men. Amon the Darfurians marriage rates are generally low. Only 38 per cent of the Bourgu and 33 per cent of the Roma are married. The figures are higher among West African pilgrims who have a strong concept of family. All the Hausa and two-thirds of the Senegalese are married. Even among the older Western Sudanese many prefer to remain single. As the Western Sudanese form the largest group in the village, the average size of family at Abu Hamir is very small. In a sample of 74 households, 35 per cent consisted of only a single man. Only 7 per cent reached six persons, which is the average family size for this District.

Few of the villagers have as yet acquired animals. In the same sample, 84 per cent of the households had no beasts. Only four had goats, probably because new arrivals do not bother with refinements like milk unless their families demand it. Rather more have beasts of burden, for these can be of practical use in settling a virgin area.

50 per cent of the villagers are occupied picking gum in the dry season. Half of those born in the District, and

half of those who have been in Gedaref more than thirty years have acquired hashab, The proportion is naturally lower among newcomers, but eight who have been in the District less than five years, including some from eastern Chad, have been provided with holdings. In this part of the Nahl Hills the hafir enabled new areas of gum forest, previously unallocated, to be tapped for the first time. Altogether over 20 per cent of the villagers own gardens. Some Darfureans, experienced in gum-tapping at home, work on other people's holdings. Cotton picking provides a good source of income. 18 per cent of the men, including Western Sudanese as well as pilgrims, spend the dry season in Gezira. Probably because there are so few Nigerians, there is a marked lack of skilled craftsmen in the village. Many are only casually or partially employed in the dry season.

The village has several Western Sudanese women who farm in their own right in the rains, and serve as prostitutes in the dry season. These women are used by the single men. They are found in all pioneer villages except those with a strong pilgrim character. They are responsible for running Abu Hamir's five beer parlours. Four of these

operate without licences, relying on the remoteness of the village to avoid police detection. The village has two shops, a laundry and a butcher, but because of the low standard of living and reluctance to spend money on food, meat is available only twice a week.

The village is not on a regular truck route. Villagers walk five miles to Ban, which is the nearest market and has a dispensary and schools. The few children at school have to board. In the rains it is often impossible to reach Ban for weeks on end, let alone travel to the towns of Qala'en Nahl or Huwata.

In 1961 the obscure and remote village of Abu Hamir suddenly found itself a major service centre. The hafir was the only source of water in the area to last throughout the dry season. The people from six of the surrounding villages came to it daily to fetch their water supplies. Attracted by the prospect of increased trade, a Buweida storekeeper transferred his shop to Abu Hamir for the dry season. Prostitutes from Ban moved into houses left vacant by cotton pickers, attracting customers from among the fetchers of water. Other empty houses were filled with squatters from outlying villages.

THE FORMATION AND CHARACTERISTICS OF NEW VILLAGES.

Abu Hamir is typical of the kind of village now being

built in response to the establishment of new water-points. The development of its present physical and tribal structure has been traced in order to show how a village of this type is formed.

The speed with which settlement commenced when work on the hafir began has already been noted. Houses are quickly built. A small hut requires about twenty posts for the framework. Talih, one of the commonest trees in the area, provides suitable timber. Dried grass is used for walls and roof. With the help of a camel or donkey to carry building materials, a single man can build a house in about a fortnight. (Without a transport animal it may take him a month.) Usually, however, a settler's neighbours lend a hand so that much less time is needed.[3] (fig.98).

Three years ago Abu Hamir consisted of several widely scattered groups of such huts. (fig.99). In the west there were two Sengalese families, who were the first to build their homes here. There was a Roma community from Chad

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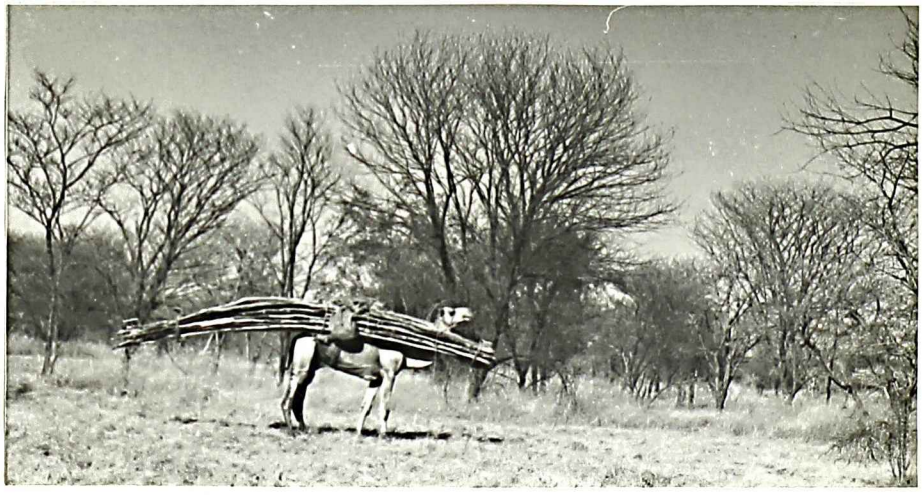
[3] (Houses in the old traditional areas of settlement tend to be more substantial. Sandy clays are available on the pediments of hills. They can be used to plaster grass walls to make them more durable. Deforestation and cultivation around these heavily-populated areas may mean that building materials have to be brought in from outlying places. If a house is made of bought materials and constructed by a professional builder, it may cost about 30 L.S. It will last a dozen or so years, compared with a simple grass hut which lasts only three or four years.)

FIGURE 98 BUILDING MATERIALS

Grass straw used for walls and thatch
Some is woven into mats, the rest
merely stood on end and bound into
place with withies



Collecting timber for the framework
from talh forest

FIGURE 98 Cont'd THEY STYLED IT IN STRAW

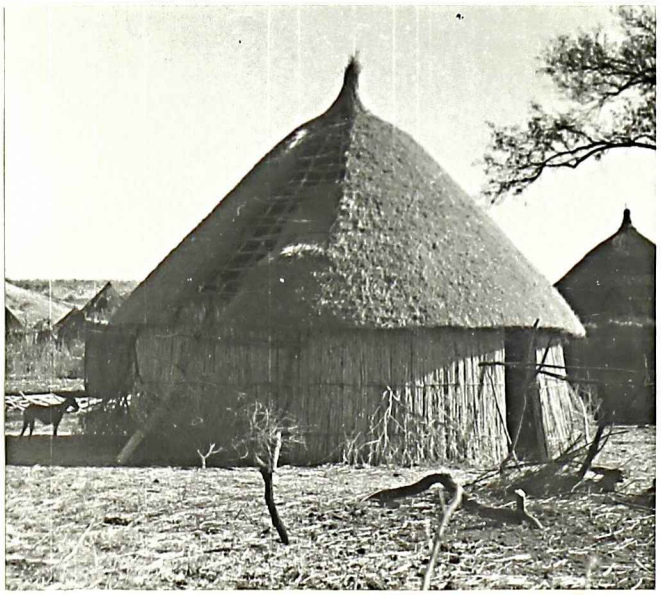
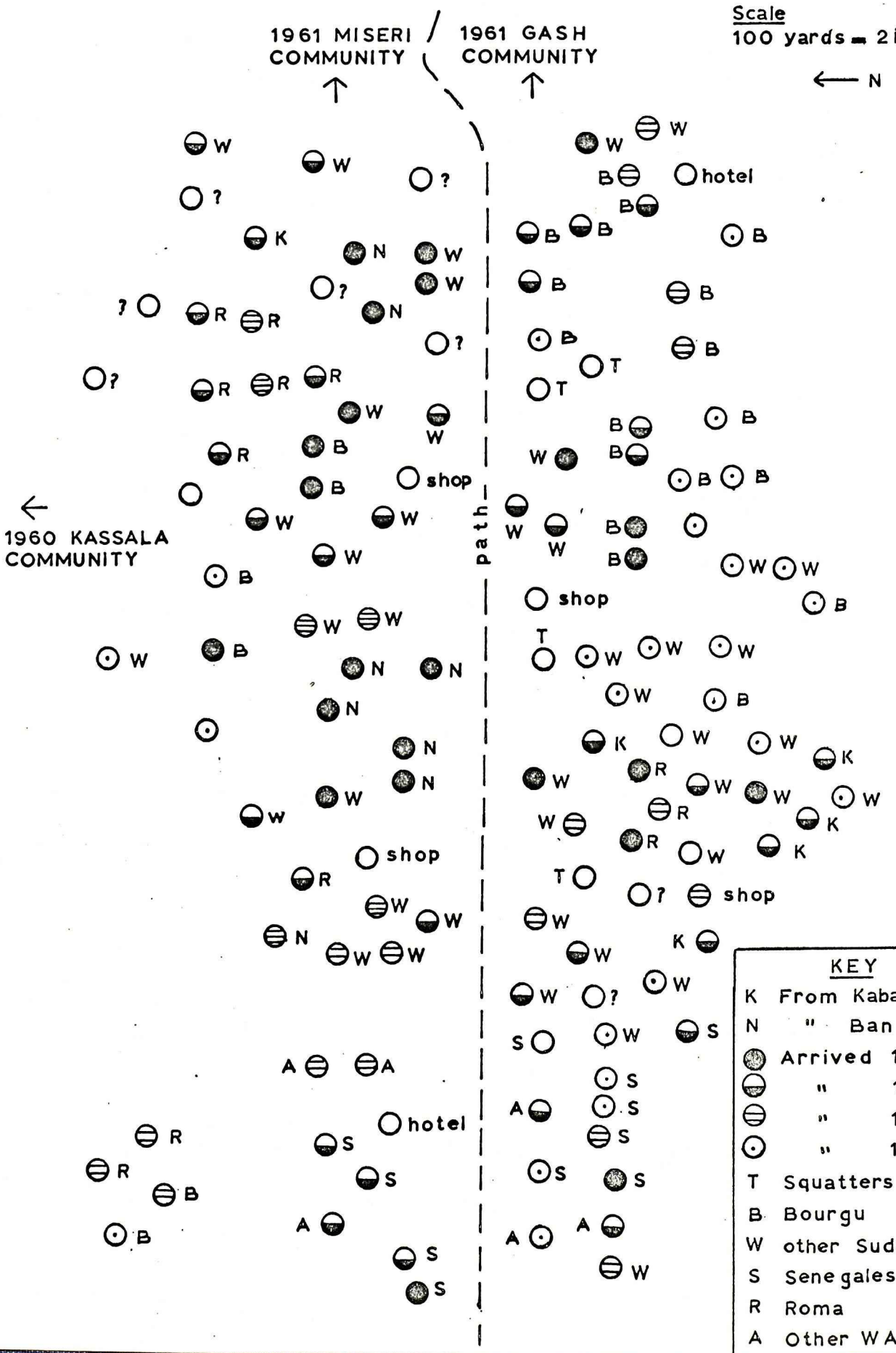


FIG. 99. AGE & TRIBE OF HOUSEHOLDS ABU HAMIR



in the south. In the north was a group of Western Sudanese from Ban, including many who had been cultivating in the area before the hafir was built. To the south-east were several widely-scattered huts belonging to Western Sudanese of various tribes.

The next year showed a sharpening of the difference between the West African community and the other settlers at Abu Hamir. The Senegalese were joined by West Africans of other tribes. Building their own guest house for travellers, they constituted a separate pilgrim group, despising the low morality of the other villagers. Meanwhile, a second influx of Roma settled, rather surprisingly, not beside the previous year's group but in the north-west. Other Western Sudanese joined the settlers from Ban or increased the scatter of huts in the south-west.

A village had just been founded at Kabaros, miles away. Founded for agricultural reasons, it had no dry season water supplies, and it used the hafir at Abu Hamir. While some villagers continued to live at Kabaros and fetched their water daily, others built themselves dry season houses on the outskirts of the village.

1960 was a year of consolidation for the main village. Many of the gaps between houses were filled in by new Western Sudanese arrivals. The village began to take on an

elliptical form around a central path. A group of new Western Sudanese immigrants from Kassala arrived and established a separate community about a hundred metres north of the main village.

1961 saw a tremendous growth in the village. The fact that the hafir filled during a year of poor rains, when many other water-points failed, was a great attraction to prospective settlers. The main village was enlarged as new buildings grew up on the outskirts. There was now little room left for additional houses at the centre of the village. Western Sudanese, many from the Gedaref Ridge, settled round the southern margin of the village. Bourgu filled in gaps in the still scattered settlements of the south-east. In the east there was a new group of Miseri. Next to them was the beginning of a separate community of Bourgu who all came from one village in the Gash. Several years of poor rains and bad harvests had convinced them of the need to move further south. Twenty families were expected, but at the time of the survey some were herding their camels and others were recouping their agricultural losses by picking cotton at Gezira.

Most recent settlements have shown a dispersed settlement pattern, like that at Abu Hamdr, during the early stages of their development. It is particularly characteristic of villages established on the clays, where

there are no physical boundaries tending to make settlement compact. Both Abu Kashma and El Gir originally showed patterns of dispersal. These villages are mixed tribally. It does not seem, however, that this dispersal of settlement is necessarily the result of tribal considerations. Utash, founded in 1960, and containing only Bourgu, consisted of similarly scattered settlements when it was a year old.

Observations at Abu Hamir show that, whenever possible, settlers choose to build houses next to their relatives, if they have any, and close to members of their own tribe. If this is impossible they tend to settle near people from their own home area, or at the very least among people with a similar way of life. Thus immigrants from eastern Chad settle beside Western Sudanese, who have similar traditions and standards of behaviour, and West Africans from different tribes and countries are drawn together by the common bond of the pilgrimage. Groups of settlers with a common background, who arrive together, tend to be more exclusive than immigrants arriving singly. Thus the Bourgu who all come from the same village in the Gash have formed their own separate community. They mix little with fellow tribesmen in the main village. Separate communities at present on the edge of the main village may become absorbed into it if the

main village continues to grow. This has happened at Calipha, where the Fulani communities have become completely surrounded by Arab and Hausa settlers.

Within the physically homogenous unit of the main village at Abu Hamir, there is considerable variation in the appearance of buildings (fig.100). The West African pilgrims surround their houses with high compound walls, even newcomers attempting to give their wives some kind of protective screen. Except for a few exceptionally wealthy men, Western Sudanese do not bother to do this, although close to the main path the number of passers-by forces them to take steps to ensure a modicum of privacy for their families. Tribal considerations influence not only architectural styles but also the distribution of services within the village. West African pilgrims lack the inclination, capital and experience to start business here. The newer Western Sudanese communities are still preoccupied with clearing farm-land. Thus all the shops, brothels and beer-parlours are in the Western Sudanese part of the relatively long-established main village.

Social relations in the village are very much as one would suspect from its physical form. Whatever their origins, the immigrants are living together in a

FIGURE 100 ABU HAMIR. A PIONEER VILLAGE IN THE PLAINS

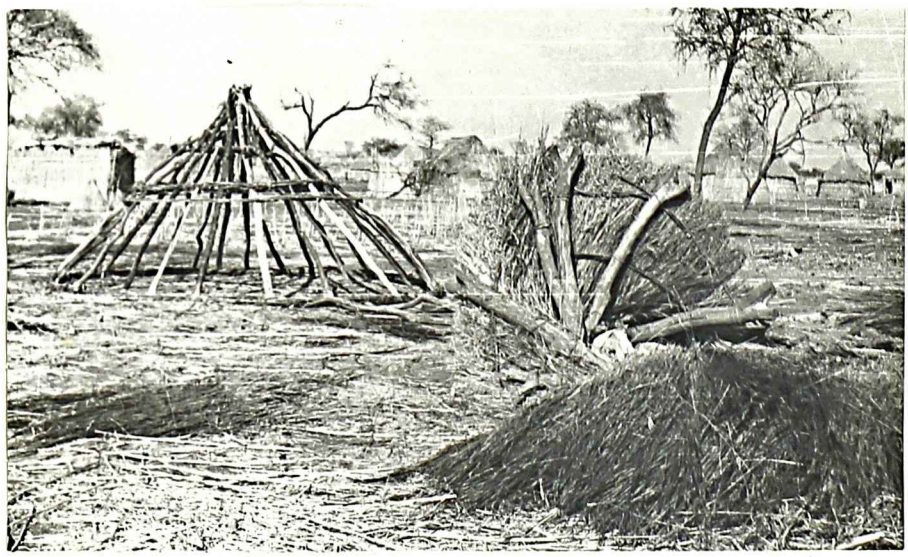
The virgin plains

The village established in partly cleared bush

FIGURE 100 Cont'd

PIONEER HOUSING

Ill-constructed batchelor's house at the end of the rains



High turnover of population. The fallen roof of a house whose owner has already left the village, with the home of a new arrival being built beside the ruin

FIGURE 100 Cont'd

WESTERN SUDANESE HOUSING

A typical home. Kitchen shelter, main sleeping hut and hen house in foreground

One of the largest homes in the village. It is also a shop(Note grain sacks on left)

The butcher

single settlement. There is need for intercommunication and a common language. All the settlers, except an immigrant who had arrived from Ghana a fortnight before the survey, spoke Arabic. Yet 47 per cent of the villagers, including two-fifths of those born in Darfur had been brought up speaking some other language. The fact that Arabic is the official language of Sudan is doubtless a further factor affecting its adoption by Western Sudanese. But West Africans, regarding themselves as in transit, do not usually trouble to learn more than is necessary for their basic requirements. Thus while Arabic is the lingua franca of the village as a whole, the pilgrims frequently use Hausa, the lingua franca of West Africa, when conversing among themselves. Indeed, often West Africans know so little Arabic that they would have difficulty in using it to achieve close social contact with Sudanese.

If a common language is a basic requirement for any form of inter-tribal communication, inter-marriage represents the closest possible degree of inter-tribal mixing. In a village like Abu Hamir, where tribes live physically very close together, inter-marriage is probably more common than elsewhere in the District. Fifteen out of sixty-two marriages in Abu Hamir were mixed. Over half were between Western Sudanese, who have little concept of tribe.

Three involved Sudanese and Ethiopian women, whom they had acquired when living in Eritrea. Especially in the past, West African pilgrims often had difficulty in finding a woman of their own tribe to marry in Sudan. Thus, four West Africans had married daughters of pilgrims of different tribes and two had resorted to marrying Western Sudanese. In Abu Hamir these mixed marriages were not criticized, although, in the District generally, they are not approved. Even among the traditionally-minded Arabs, however, most villages have one or two examples of mixed-marriages, usually between members of tribes in the same major tribal group. The figure for inter-marriage in the District as a whole is probably 2-3 per cent.

The development of authority in Abu Hamir reflects not only the mixed composition of the village but also the general dominance of the Western Sudanese in a council administered by a Western Sudanese nazir.

When the village began, the first settler, a West African, assumed unofficial headship of the embryo village. Foreigners do not usually wield authority over Sudanese, even in pioneer villages. Thus, when Western Sudanese from the surrounding areas arrived, the nazir appointed a man of his own tribe who was living in the administrative centre of Qala'en Nahl, as official sheikh.

By 1961 there had been a certain fragmentation of authority. A Senegalese had set himself up not merely as leader of his tribe, but of the whole pilgrim community. The new Bourgu colonies from Gedaref and the Gash arrived with their own leaders. Meanwhile some of the Western Sudanese, mainly those coming from Ban, were giving their loyalty to one of their own number. The Fur sheikh was still theoretically responsible for administering the whole village, but the other leaders were increasingly assuming the responsibilities of sub-sheikhs.

A division of authority is not unusual in a village of this size, although among old-established Arabs, hereditary sheikhs, with the weight of tradition behind them, often administer larger villages. In a new settlement the sheikh's authority lacks the weight that comes from long tenure in office. At the same time he has to deal with settlers who have already shown themselves unwilling to settle down to a steady life. In Abu Hamir the sheikh's only power derives from his appointment by the local nazir. He has few fellow tribesmen in the village. As long as Abu Hamir was tribally very fragmented this did not matter, but as soon as tribal groups became larger they could challenge his authority. Parties of immigrants arriving

from a common place of origin formed sources of potential, well-organized opposition. The existence of two such different peoples as Western Sudanese and West African pilgrims right from the beginning, made it likely that there would be a division of leadership, in practice if not in theory. The fact that the Fur sheikh is drunk for days on end scarcely endears him to the puritanical pilgrims, and makes it much more difficult for him to administer the village effectively.

EFFECTS OF THE MECHANICAL CROP PRODUCTION SCHEMES ON LIFE IN GEDAREF DISTRICT.

Kassala is now the second most important grain-producing province in Sudan, only Blue Nile producing more. Kassala has a relatively low population and is consequently able to export much of its grain either to the urban areas of Sudan or abroad, both for human consumption and for animal fodder. In 1960-61 it contained 35 per cent of the country's total acreage of dura. This prominent position is largely the result of the Mechanical Crop Production Schemes. With about 600,000 feddans under dura the schemes produced nearly two-thirds of the grain of the province. Over 60 per cent of the cultivated land in Gedaref District lay within the M.C.P.S. The schemes produced 67 per cent of the dura of the District, though only about 20 per cent of its sinsim.

THE MECHANICAL CROP PRODUCTION SCHEMES.

The M.C.P.S. was imposed upon Gedaref from without. It is essentially alien to the traditional way of life of the District, and the people of Gedaref have taken little direct part in its activities.

For this reason the organization of the schemes will be

dealt with only briefly here.[4] The M.C.P.S. began in 1945, when there was a considerable food shortage in the Middle East. At that time cultivation was organized by the government, which provided machinery and used unemployed urban vagrants as labourers. This method proved inefficient. In 1948 a participating-cultivators scheme was introduced. Cultivators received twenty feddan holdings which the government prepared and sowed in exchange for 55 per cent of the final crop. This also was uneconomic and the method was abandoned in 1953. The area was now divided into thousand feddan holdings, which were rented to wealthy Sudanese for a nominal sum. The scheme-holder provided his own machinery and arranged for his own labour-force. The government retired to an advisory position.

The area under the M.C.P.S. has expanded considerably since 1945, when 12,000 feddans north of the railway were cultivated. In 1950 the schemes were extended south of the railway. In 1957 the northern area was enormously expanded and a new area east of the Ridge at Gabob was demarcated. The total area within the M.C.P.S. is now about a million

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4 (For details of the early operations of the schemes see Laing 1953 and Sudan Government 1954).

feddans (see fig.4). Of these about 625,000 feddans have been cultivated in the last few years (fig.101).

FIGURE 101. AREA UNDER CULTIVATION IN THE MECHANICAL CROP PRODUCTION SCHEMES.

	(feddans)
1945-6	12,000
1946-7	21,000
1947-8	3,000
1948-9	8,805
1949-50	6,459
1950-1	27,608
1951-2	No figures available
1952-3	" " "
1953-4	" " "
1954-5	100,000
1955-6	117,000
1956-7	262,000
1957-8	475,000
1958-9	625,000
1959-60	1,175,000
1960-61	625,000

Source. government files, M.C.P.S. Wad el Huri, and Ministry of Agriculture, Khartoum.

Further expansion is envisaged by the government. In the north, however, the boundaries of the M.C.P.S. are already in areas where rainfall is adequate for cultivation in only about seven years out of ten. Expansion to the south involves clearing heavy bush at rates of over 3 L.S. per feddan, and as these charges have to be met by the scheme-holder few people are prepared to rent new schemes in this area. Moreover, in the south the early rains may be so heavy that the ground is impassable for tractors before planting is completed.

Normally the land is prepared for cultivation by disc harrowing[5] after the rains have caused the weeds to germinate. A second disc-harrowing to eliminate late-germinating weeds is followed by sowing. Such additional weeding as is necessary, and all harvesting, is done by hand. Because of its uneven stands and dropping heads, Sudanese dura cannot be harvested mechanically (fig.102). American varieties which can be harvested by combine are not considered palatable by Sudanese.

Some of the problems facing scheme-owners are the same as those facing ordinary farmers. In addition there are others. On the heavy clays breakdowns of tractors are frequent, and adequate spare parts are seldom available. Each scheme needs a labour-force of about two hundred at harvest-time. As local people will not do this work, labour is usually in short supply.

The scheme-holders, who need to have a bank balance of 2,000 L.S. are usually business men. Many come from Khartoum or Wad Medani. They employ managers and seldom come to Gedaref themselves. They have little interest in

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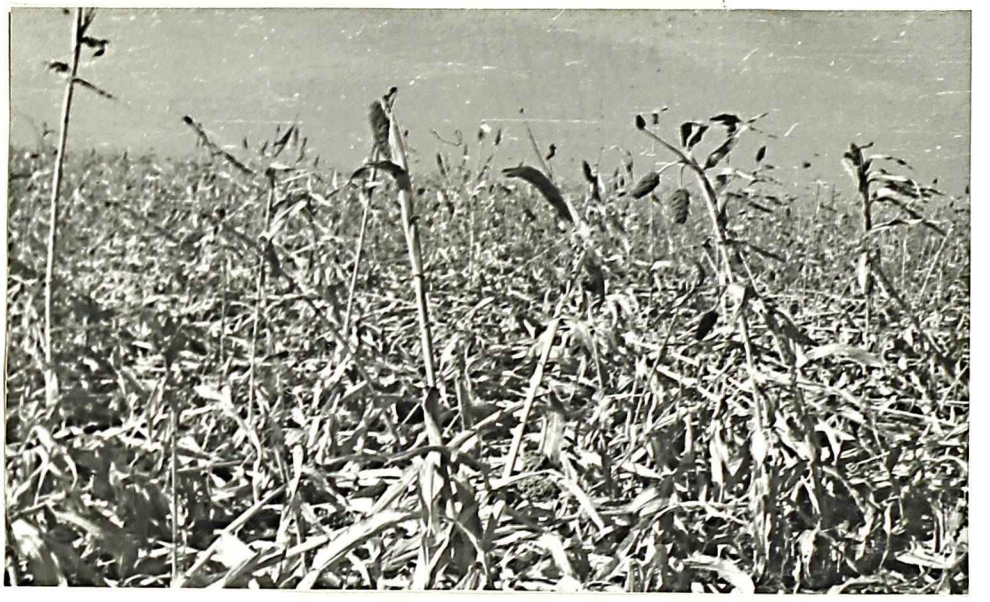
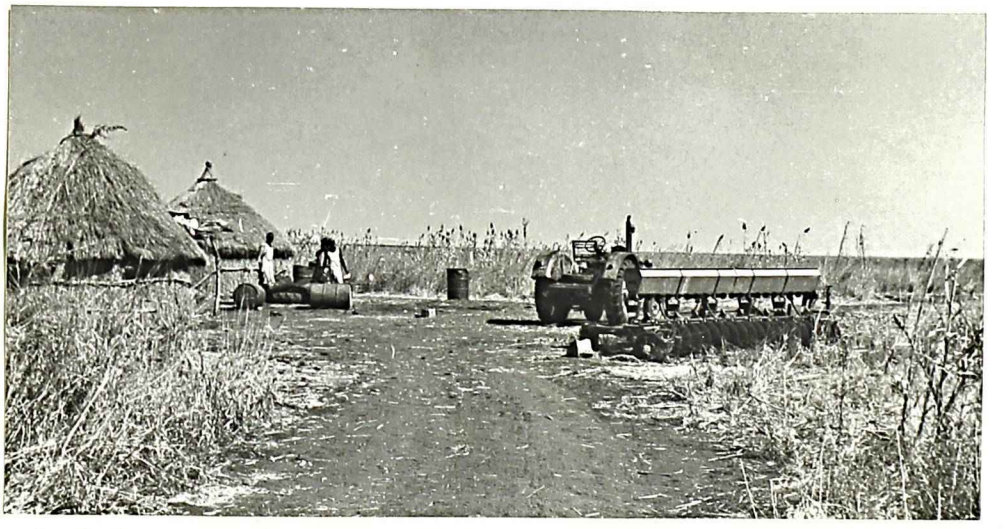
5 (the clay soils do not require deep ploughing. The cracking of the clay in the dry season aerates the soil. It also enables the top three or four feet of soil to be turned over, for particles of surface soil drop down into the cracks).

FIGURE 102 THE M.C.P.S.



Dura



A Labourers' camp. Note petrol drums, tractor disc harrow and seed drill

Gedaref grain market

agriculture, but only in quick profits. Most of their labor force comes from Western Sudan. Their agents often recruit workers at the railheads of Medani and Sennar. Altogether about 13,000 labourers are required by the M.C.P.S. each year. When harvest is over many of these labourers do not return. They drift into Gedaref Town where they constitute a considerable social problem.

EFFECT OF THE M.C.P.S. UPON THE TRADITIONAL WAY OF LIFE.

Few people in Gedaref are wealthy enough to be scheme-owners, but some merchants in Gedaref Town have schemes. So too do the nazirs and important sheikhs, some of the more enterprising Arabs, and a few well-established Western Sudanese. Altogether probably only about thirty people from the rural areas have schemes.

Nor do the local villagers usually take part in the schemes as labourers. They are busy with their own farms for most of the time when the schemes require workers. They also regard labouring alongside Western Sudanese navvies as degrading.

Although the bulk of the people do not participate directly in the schemes, the very existence of the M.C.P.S. has considerably altered the way of life of the District.

Many villagers lost harig when the M.C.P.S. was established. Indeed, the site of the original scheme area

was chosen precisely because it consisted of grassland which did not need clearing. Previously enterprising local farmers had cultivated wide areas here. They could obtain higher yields from this land than they could from their older bildat.

Villages on the edge of the M.C.P.S. have had their bildat land consolidated so that it does not project into the area of the schemes. In many cases this has meant that cultivation has become more concentrated. Less land can be fallow. Over-cultivation and lower yields result. (see village study of Abu Nagga).

Not only have some farmers lost part of the land they used to cultivate, but all of them have been faced with lower prices for their crops as a result of competition from the M.C.P.S. Peasant production of dura now forms a small proportion of the whole, and has little influence on prices. A combination of increasing urbanization and limited supplies of grain would have enabled the Gedaref producers to command high prices, had not M.C.P.S. production glutted the market. As it is, the home market is saturated and only low prices can be obtained by exporting the surplus.

While the government made some compensation for the loss of harig, it made none for the loss of hashab trees. The matter was supposed to be one for litigation between

the claimant and the scheme-owner who actually felled the trees. Since the latter was usually an absentee, and since schemes changed hands so rapidly, it was impossible for the ordinary farmer to embark on these proceedings. The councils planted a few gum gardens as compensation but they were not enough. In the light of the substantial addition to their incomes that the local people receive from gum, and the very marginal profits of scheme-holders in recent years, it seems that the harm done by cutting down hashab has not been fully justified.

The establishment of the M.C.P.S. however, has not seriously disturbed local grazing patterns. Cattle soon become accustomed to eating dura straw in the dry season. It is not much less palatable than the coarse perennial grasses in the south. In some cases, by establishing water-points primarily for harvesters, the grazing situation is actually improved. The remains of the water is used by beasts, and enables them to range a larger area than before. (Animals cannot graze the area in the rains, but beasts are normally at their villages or in Butana anyway during this period).

Moreover, contact with the schemes has brought about some improvements in local agricultural techniques. The

large-scale undertakings inspired some farmers to extend their cultivation. There seems to have been a marked increase in the employment of field labour. It was doubtless easy to tap the large labour force attracted by the schemes. It is estimated that local farmers now employ about 7,000 labourers each year.[6]

Others have extended their area of cultivation by means of machinery. Country farmers on the Ridge now own at least forty tractors. Tractors represent an investment of over 2,000 L.S. From this it appears that the schemes have persuaded people of the benefits of mechanization. Not all the tractor owners have schemes. The rest use tractors on their bildats.

For every farmer owning a tractor there are tens of farmers hiring them for cultivation. Rates vary from 1.15 L.S. to 1.75 L.S. an hour. In villages both within and on the outskirts of the schemes, the use of tractors seems to be almost universal. At Hassan, where all tractors were hired, 75 per cent of the villagers used them for over ten hours. Even further from the M.C.P.S. in a poor ultra-conservative village like Hagokat, only three people

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[6] (government files, Administrative Offices, Gedaref.)

cultivated entirely by hand. In overcrowded areas of the Ridge men may find it worthwhile to acquire distant fields specially for cultivation by machinery, local bildat being too small for this purpose. (see. village study of Assar).

Indirectly, the M.C.P.S. have enabled new areas to be opened up for peasant cultivation. To assist scheme-holders roads have been built and improved, not just in the M.C.P.S. itself but also through adjoining areas of bush, and local farmers have established agricultural camps along these roads. If necessary they buy water from trucks while they cultivate.

Some of the prosperity the M.C.P.S. has brought to the middle-class merchants and entrepreneurs of Gedaref Town has spread to the humbler people of the rural areas. West Africans from the Rahad find a ready market for dried fish among scheme labourers. The demand for building materials, both from the schemes and from the growing population of Gedaref, means that villagers with camels can earn good money by extracting timber from the remaining areas of forest. Pilgrims find dry-season portering jobs connected with the marketing of produce.

In these ways, both directly and indirectly, the M.C.P.S. have influenced the life and the development of those parts of the District which lie outside their bound-

aries. Within the area of the schemes themselves, villages have been established. Like those in the rest of the clay plains they are built near hafirs or deep bores. In their history and in the way of life found within them, however, they are different from the spontaneously-generated hafir settlements found elsewhere.

HAFIR VILLAGES IN THE M.C.P.S.

The sites of all villages in the Plains are much alike, but those within the M.C.P.S. are even less attractive than those in the virgin bush. Settlements in the M.C.P.S. are not surrounded by forest or scrub, but by cultivated land. They lack timber for fuel and building. Except where settlement began before the land was cleared for schemes the villages are bare of shade trees.

In order to assist filling, hafirs are usually sited on low ground. This is liable to be particularly swampy in the rains. Logically a village would be sited a short distance away from the hafir on higher terrain. But within the M.C.P.S. villages are often very close to hafirs to allow more land to be cultivated. They may, therefore, be extremely unpleasant in the rainy season.

POPULATION AND SETTLEMENT.

Although the M.C.P.S. is only fifteen years old, the history of its settlement shows several distinct phases. The earliest villages in the area existed before the establishment of the schemes. They were located along the railway line, and when their hand-dug hafirs dried, trains brought additional water. When the schemes began the fields of these villages were consolidated into large blocks.

When permanent water supplies were first provided in the Plains, the government hoped that people would move from overcrowded northern Sudan into these relatively empty areas. The participating-cultivator scheme was designed to attract them to Gedaref. But there were few immigrants. Northerners are attached to their homeland, and consider that the clays are unhealthy. By 1952 only 13 per cent of the holdings had gone to people from Northern Province. If there were few immigrants from other provinces, the M.C.P.S. did attract some Arabs from the drier, northern parts of Kassala. The group most eager to participate in the schemes, however, were local people from the overcrowded parts of the Gedaref District, particularly from Gedaref Town. In 1952, 65 per cent of the participants came from the Ridge. Figure 103, which shows the population structure of the four largest M.C.P.S. villages, clearly

illustrates the situation in 1951.

FIGURE 103. SETTLERS IN FOUR M.C.P.S. VILLAGES IN 1951.

Village	Percentage of all settlers in the village who were:-	
Ghadambaliya (North Rural Council)	Ricabin (from northern Kassala province)	48
	Cuahla (from north-eastern Kassala province)	25
	Jaalin (mainly from the Ridge)	
	West Africans (mainly from the Ridge)	27
		100
Leiya (North Rural Council)	From Gedaref Town	57
	Beja (from northern Kassala province)	20
	Batahin(" " " ")	15
	Kenana (from Kordofan)	8
		100
Um Sugura (South Rural Council)	From Gedaref Town	45
	From nearby Ridge villages	46
	From elsewhere	9
		100
Um Bileil (South Rural Council)	Western Sudanese from the Ridge	100

Source. government files, Administrative Offices, Gedaref.

After the participating-cultivator scheme was abandoned in 1953, the government took no further active part in establishing new villages. Settlement was allowed to proceed spontaneously and those entering the M.C.P.S., were the same types of people as those joining other hafir villages.

There have been almost no new immigrants from the north. Only five villages in the schemes contain Arabs, and in two instances they come from Gordofan in the west.

Most of the M.C.P.S. villages are in Gedaref South Rural Council, where Arabs might be reluctant to live.

Many hafirs in Gedaref North Rural Council have never been settled. There is always doubt as to whether these northern hafirs will fill adequately. Such water as is left after the agricultural season is usually made available to nomads, who bring their cattle to graze the stubble. (Water permits for this purpose are obtained from the council offices).

In fact only four villages have been founded since the M.C.P.S. was turned into thousand feddan holdings. Once schemes have been established round a water-point, the government is not anxious to have new settlers, for the layout of the existing schemes would have to be changed in order to provide them with bildat. Indeed, in the last four years no new villages have been allowed within the M.C.P.S. and the government has refused to provide existing villages with additional land.

New villages in the M.C.P.S. received their holdings in a single rectangular unit. As their populations grew, all the available land within their blocks was required for cultivation. Thus, villages are compact in shape - very unlike those in other parts of the Plains, where there is ample room for expansion. The houses themselves tend to

be small and unprepossessing. Because of the absence of local timber and perennial grass, dura stalks are used to build frail huts. The early participating-cultivators were better off than more recent arrivals. The government provided them with building materials, and while the scheme area was still being cleared, timber was available.

LIFE IN THE M.C.P.S.

Indeed, many of the major attractions of living in hafir villages are not found in M.C.P.S. settlements. There is no nearby bush into which the energetic cultivator can extend his fields. There are no forest products to bring in a steady dry season income.

In most M.C.P.S. villages land is now scarce. Villages have grown so much that some cultivators are sharing their twenty feddan holdings with relatives and friends. There is no opportunity for land to be fallow. Most of the settlers left the crowded Ridge in order to escape from the problems of over-cultivation and fragmentation of holdings. Yet it seems that there is danger of these very conditions being recreated here.

The villagers are influenced by the large-scale agriculture around them. Most use tractors. Many occasionally take advantage of the opportunities for

employment on the schemes. If they are still in need of money, they work as harvesters when their own farming activities are over. (But Arabs, like old-established farmers outside the M.C.P.S. are reluctant to do this work).

As in other hafir villages, water supplies may not be adequate throughout the year. Villages are often half-empty in the dry season. The general absence of local employment after January means that many West Africans and the more energetic Western Sudanese find temporary jobs elsewhere.

Because of the relative isolation of settlements, the difficulty of building a good house, and the high cost of fuel, a fair number of settlers use their M.C.P.S. villages only as agricultural camps. They maintain a permanent home for their families in one of the traditional areas of settlement and return to it after harvest.

Inhabitants from villages which were established before the schemes often have hashab. So, too, do many immigrants who have come from living on the Ridge or in the Nahl Hills. They are away from the M.C.P.S. at their gum gardens for much of the dry season.

After harvest there is ample grazing for stock in the M.C.P.S. and in fact only five villages have no cattle. In over half the settlements, however, water-supplies are

not adequate for watering stock in the dry season. Water-points in the schemes are often close together and cattle can travel daily to neighbouring hafirs or deep bores (fig.104). Only in four villages do animals have to become transhumant. Where a village is able to water animals, a large number of nomadic herds and cattle from neighbouring villages concentrates on it. There may be considerable over-crowding and consequent loss of grazing round the water-point.

FIGURE 104. DRY SEASON WATER-POINTS FOR M.C.P.S. CATTLE.

Percentage of villages with cattle drinking:-	
At home in the dry season	43
At neighbouring water-points	38
At the R.Rahad	19
	100

In the rains cattle cannot be grazed locally because of the growing crops. Beasts are sent to the nearest area of grassland. The Arabs, who are the biggest cattle-owners, live in the northern part of the M.C.P.S. and have good connections with local nomads. It is thus easy for them to send their stock to Butana in the rains.

As has been seen, the scope of life within the M.C.P.S. is somewhat limited. Considering the pioneer qualities

required to live in this isolated, unattractive environment, it offers relatively few opportunities. Now that fresh bildat is not available within the schemes, few new immigrants are attracted to the area.

STUDY OF A HAFIR VILLAGE IN THE M.C.P.S.

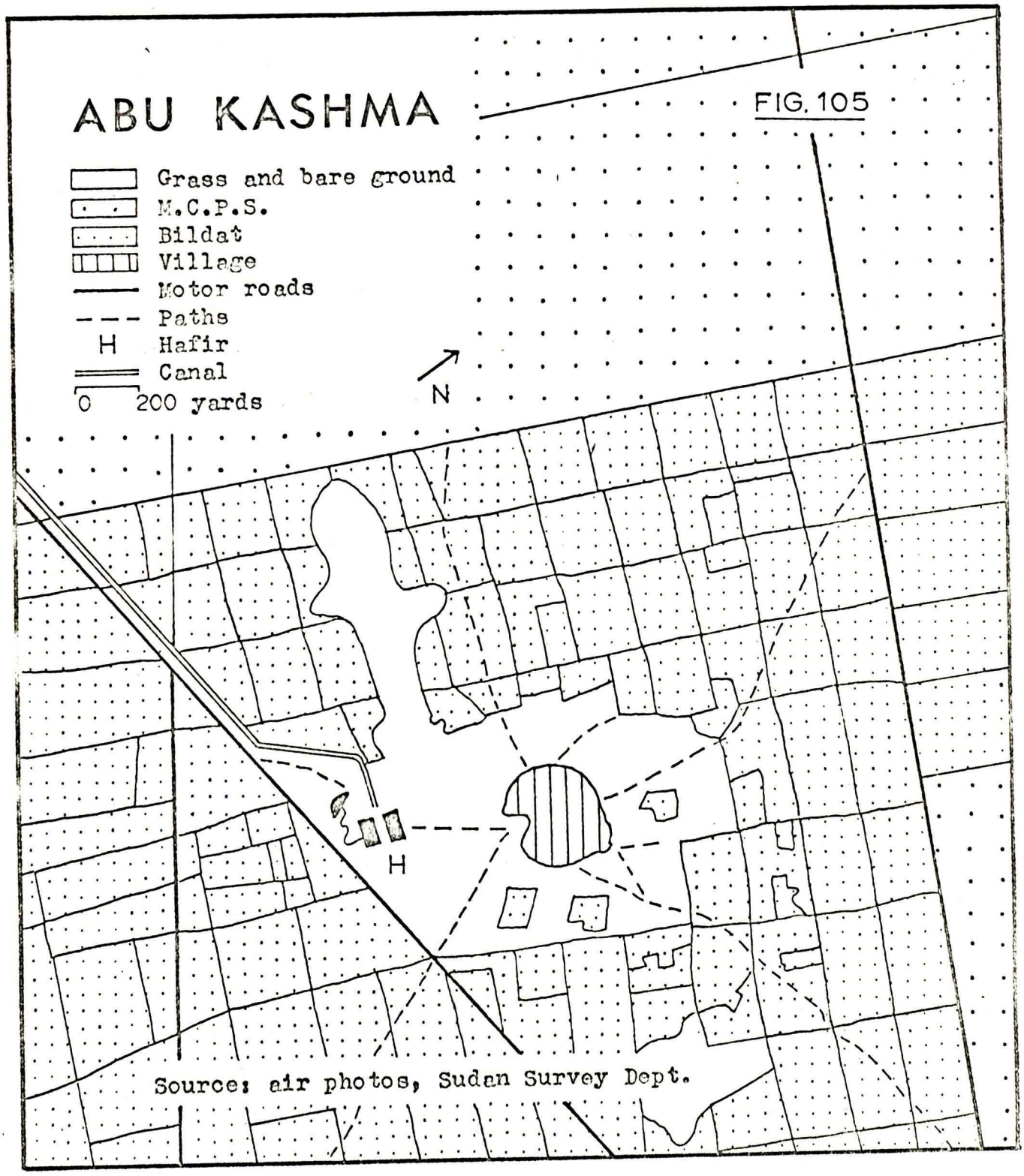
ABU KASHMA.

Hafir Abu Kashma lies in the north part of the Mechanical Crop Production Schemes. Twin tanks were dug in 1947, and they are among those fed by the canalized course of Khor Abu Fargha. The original inlet canal was faulty, and it was not until 1950 that the design was rectified. By 1953 the hafir had proved its ability to fill. The first settlers arrived under the share-cropping scheme that was abandoned later in the year. (fig.105).

Most of the original settlers came from the dry areas around Kassala or the overcrowded Gedaref Ridge. Many were from Gedaref Town itself, where it is now almost impossible for newcomers to obtain farm-land. As the village became known, people arrived from further west. They often came to join relatives. (fig.106).

FIGURE 106. ABU KASHMA. AREAS FROM WHICH SETTLERS CAME.

Areas	Number of adult men.
Nigeria	8
Chad	9
Darfur	4
Kordofan	8
River Rahad	4
Gedaref Ridge	25
Kassala District	12
Rest of Kassala Province	1
Saudi Arabia (Mecca)	3
Total	74


ABU KASHMA
FIG. 105
Grass and bare ground
M.C.P.S.
Bildat
Village
Motor roads
Paths
H Hafir
Canal
0 200 yards
N
H
Source: air photos, Sudan Survey Dept.

The village contains the usual mixture of Western Sudanese and West Africans found in hafir settlements. 84 per cent of the householders are West African. This perhaps accounts for the relatively small number of tribes found in the village, for tribal diversification is a feature of Western Sudanese communities. Although many West Africans came to the village from places in Sudan, almost all are on the pilgrimage. Apart from six Hausa from Gedaref Town and seven families from the Bornu colony at Kassala, all the West Africans were born outside Sudan. Indeed, the atmosphere in the village is remarkably pious - certainly in comparison with the boisterous life at Abu Hamir - 51 per cent of the men had been to Mecca. Most surprisingly, they included one of the two Arabs and a couple of Western Sudanese. Both Hausa and Bornu children receive regular instruction in Koran from faqis of their own tribe. The Bilala are probably the least earnest of the West Africans. Not only have a smaller proportion of them seen Mecca, but a larger proportion show no enthusiasm to save for the journey. They prefer to remain idle in the dry season.

Families are much larger than at Abu Hamir, no doubt because there are more West Africans (see fig.45). Only 7 per cent of the households consist of single men and 26 per cent reach the District average family size of six.

Many settlers have strong kinship ties within the village. 19 per cent of the men have their father living with them and an additional 60 per cent claimed to have cousins of some sort at Abu Kashma. The village is not so isolated as Abu Hamir and is therefore more suitable for families. Except in the rains, settlers can get into Gedaref on the trucks that pass daily on the road two miles away.

The different tribes entered the village at different times (fig.107). The Bornu from Kassala were the first arrivals. The Hausa came mostly between 1954 and 1958, and the Bilala have produced a steady trickle of immigrants since 1956. The inflow of settlers reached a peak in 1957, when 20 per cent of the present population arrived. By this time it had become clear that the hafir held enough water to support a village throughout the year. Since then the number of immigrants has decreased, mainly because land has become limited.

FIGURE 107. ABU KASHMA. GROWTH OF VILLAGE.

Year.	Number of New Immigrant Families.				
	Total.	Sudanese[1].	Bornu.	Hausa.	Bilala.
1953	11	1	6	2	3
1954	8	0	1	7	0
1955	9	1	1	7	0
1956	6	2	1	1	2
1957	15	6	0	8	1
1958	11	2	0	6	3
1959	7	1	2	1	2
1960	7	2	0	2	3
Total:	74	15	11	34	14

[1] All are Western Sudanese but for two Arab families.

When the M.C.P.S. was divided into thousand feddan holdings, the bildat land available to villages was demarcated. Abu Kashma is now completely surrounded by schemes. It has not been possible to give the village more land as its population grew. Newcomers cannot now receive bildat unless a pilgrim family has left the village, or another villager, usually a relative, is prepared to divide his farm, thus reducing his own agricultural income. Additional families are therefore discouraged from settling at Abu Kashma unless they are replacing people who have left.

The original share-croppers received holdings of twenty feddans. About 65 per cent of the villagers still have farms of the standard size. Nearly 20 per cent, however, mainly the older settlers, have acquired double holdings. Generally the size of holding bears a direct relationship to the length of time spent in the village. Those with holdings of forty or more feddans have spent an average of 5.8 years in Abu Kashma, compared with the 2.7 years of the 17 per cent who have holdings of ten feddans or less.

Thus, the Western Sudanese, Hausa and Bornu tend to have larger holdings than the Bilala, who from the majority of recent arrivals at the village. Doubtless because of their nationality, the Sudanese have been able

to secure ample land for themselves. One of the Jaalin Arabs has 100 acres. As late as in 1960 he managed to get a double holding for his brother. A Western Sudanese is the biggest farmer. He has a 1000 acre scheme as well as bildat in the village.

Surrounded by mechanized agriculture about 80 per cent of the farmers hire tractors. (fig.108). Since an average family can cultivate only about ten feddans, most of the farmers would have to employ either machinery or labourers on part of their bildat. As many of the villagers are pilgrims and anxious to save money, tractors are not hired more than necessary. Over 60 per cent of the villagers cultivated part of their fields by hand while using mechanical equipment on the rest. None of those with ten feddans or less needed to use machinery. Those using tractors on the whole of their farms were usually the well-to do with forty feddans or more.

FIGURE 108. ABU KASHMA. NUMBER OF HOURS FOR WHICH TRACTORS ARE HIRED.

Hours	Number of men hiring tractors for this number of hours:-
0	16
1	2
2	39
3	2
4	7
5	0
6	1
7	0
8	6
over 8	1
Total:	74

Note. A tractor cultivates about five feddans an hour. Thirty-one of these people have standard holdings. They cultivate ten feddans by hand and ten by machinery.

Although most villagers hire machinery and even occasionally employ labour on their own farms, 38 per cent are prepared to work on M.C.P.S. schemes. Since schemes lie all around them, this is certainly the most obvious source of dry season employment available to the villagers. As it can be done on a casual, daily basis, it need not interfere with normal farming activities. Unlike villagers from outside the schemes the people of Abu Kashma do not seem to regard this work as in any way degrading. With this source of wage earning near at hand, few have to supplement their incomes by leaving to pick cotton or to fish. (A few Bourgu, who enjoy travelling, go to Gezira, (fig.109).

FIGURE 109. ABU KASHMA. DRY SEASON OCCUPATIONS.

Occupation	Number of men engaged in it.
Scheme labouring	23
Portering	11
Casual jobs in Town	8
Cotton picking	5
Fisherman	1
Mechanic	1
Blacksmith	1
Hairdresser	1
Unemployed	18
Total	74

If villagers leave Abu Kashma in the dry season, it is usually in order to go to Gedaref Town. About a quarter of them find jobs there. The Hausa in particular find opportunities of plying their crafts in the Town but in default of such employment will take other work, such as portering. Eleven families used to live in Gedaref Town, and nine still have houses there. When men first became share-croppers in the M.C.P.S. many merely lived on their holdings in the rains. They kept their families in the Town and returned to them when the agricultural season was over. As the M.C.P.S. settlements became better established, they began to acquire the characteristics of permanent settlements. As Abu Kashma shows, however, even after eight years many households are reluctant to abandon their links with the Ridge.

As is usual among the older M.C.P.S. villages, the people of Abu Kashma have cattle. One of the twin tanks of the hafir is reserved for the villagers, but the other provides water for labourers on the schemes and animals. Abu Kashma's cows are joined by stock from Kilo Sitta. The bore at Kilo Sitta provides plenty of water for animals, but at Abu Kashma's hafir they can drink free. The tank used by animals at Abu Kashma dries up in April, and for two months cattle from Abu Kashma as well as Kilo Sitta have to pay to drink from bores. The cattle of Abu Kashma go to Huri. This is so far away that they cannot return to the village between waterings.

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PART 3

CHAPTER IX.

ATTITUDES TO LIMITED WATER SUPPLIES.

In the previous four chapters we have seen that new ways of life in certain selected villages are affected, at least in part, by the availability of water supplies. In the next two chapters man's reactions to limited water supplies are examined both more generally and more critically, using data collected from all the villages in the area studied. Social attitudes to the exploitation, extraction and use of such water as is potentially available are considered. Then the effects of seasonal and irregular water shortages of various kinds upon man's ways of life are examined. Finally thought is given to the way in which water supplies influence changes in the settlement pattern.

1) THE CONSTRUCTION OF WATER POINTS.

In an area where water supplies are short, those who open up new water-points perform a valuable public service. Inasmuch

as the selection of sites for water-points is subjective, the individuals who supply new sources of water influence the pattern of settlement.

In the past as in the present, the initiative of opening up new water-points has rested both with individuals and with government authorities. The authorities, once the traditional tribal leaders, are now more often the rural councils or specialized departments of the central government.

Today the proportion of water-points opened up by individuals is about five per cent, considerably lower than it was previously. Nevertheless the motives prompting individuals to provide new water-points remain essentially unchanged. A man who has established himself as leader of a group is anxious to find water so that he can found a village for his community. Thus a well near Assar was built by a religious man, who wanted to settle with his disciples away from other distractions. Other wells were dug by cultivators wanting to live near their fields to avoid having to walk many miles to their farms carrying water. The well at Hassan was dug by one such farmer. People like this have contributed to the spread of population on to the clays.

More frequently individuals opening new water-points do so in their existing villages. A rich man may acquire prestige by paying for a well to be built for the benefit of the

community. Where underground water is available others may construct private wells within their courtyards. During the Turkish occupation Assar is said to have had over eighty such private wells. Other wells are built as capital investments. They are used for irrigating gardens or watering stock.

Most of the water-points opened up by individuals are wells. Wells cost rather less than 3 L.S. per metre to dig. Only three or four workmen are needed. Hafirs require a much larger labour force if they are to be built in a season, and are much more expensive to construct. A labour force of fifty would take five and a half months to excavate a small hafir of 5.000 cubic metres. It would cost anything from about 5 L.S. to 400 L.S. in wages.[1]

Before the Mahdia probably ninety per cent of the hafirs and over fifty per cent of the wells were built communally. Most of the rest were built by individuals. The construction of hafirs in particular lent itself to co-operative effort. The water-points were constructed in the dry season, when tribesmen had ample free time. They were organized by sheikhs

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[1] (government files. Administrative Offices, Gedaref).

of energy and initiative who instigated proceedings.

After the Mahdia the government began to take a more active interest in opening up new water-points. The Fung and Turkish authorities had built a few wells, but only to facilitate their administration. The condominium government was interested in the general economy and welfare of the area. As early as 1906 the governor of Kassala wrote "It is important that many more wells should be opened up as the whole development of the country depends on water supplies." [2] Increasingly the local government authorities assumed the responsibility of providing water-points, although, as in the case of Major Evan's hafirs, the people were sometimes required to contribute towards their construction. The government's decision on the number and location of water-points to be constructed enormously influenced the development of the area. The building of wells in the serpentine and of hafirs on the edge of the clays was a conscious attempt to spread settlement and enable more of the plains to be utilized. The consequent opening up of these new areas was probably carried out much more rapidly than if it had been left to individual or tribal enterprise.

Today, most wells and hand-dug hafirs are still dug at

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[2](government files. Administrative Offices, Kassala).

the instigation and expense of the local authorities. The present rural councils are more democratic than the condominium administrators, and consequently the siting of water-points is now influenced by local politics. Outlying pioneer villages may suffer in comparison with large villages in the traditional settlement areas, which can exert powerful pressure on the councils. Thus a high proportion of the new water-points may go to old villages in areas which are already over-populated and over-cultivated.

The initiative in constructing deep bores and mechanically-excavated hafirs, however, lies with the central government. The rural councils may only suggest sites. In 1944 the Rural Water Development and Soil Conservation Board[3] was established to advise the government on allocating money for the development of water supplies in the provinces. The Board soon became preoccupied with digging hafirs and bores. Since the provinces, Darfur excepted, could not afford the machinery necessary for excavation and drilling, the Board had a monopoly of opening-up these water-points. National interests, which the Board as a national body was

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3 (In 1956 the Rural Water Development and Soil Conservation Board was succeeded by the Department of Land Use and Rural Water Development, which had rather greater powers.)

bound to further, required that the central clays be utilized, and Gedaref was one of the districts to benefit from this policy of establishing water-points in the plains. The scale of development far exceeded anything that could have been financed by the rural councils. An average hafir of 10,000 cubic metres costs about 3,400 L.S. to excavate mechanically. A single bore, 166 metres deep (the average depth for those in Gedaref) costs about 1,250 L.S.[4] Altogether, in the last sixteen years, over 300,000 L.S. was spent on mechanized hafirs and bores in the area studied alone, while the figure for the whole district was probably nearly twice that amount.

In the last decade only about fourteen water-points were opened up privately, and of these only six were constructed by communal effort. This decrease in personal initiative means that villages are seldom founded now without at least the tacit approval of the government which provides their water. It seems that the co-operative development of water resources is a thing of the past.

The old power of the tribal leaders, who were responsible for instigating communal projects, went with the Mahdia. Afterwards, the sheikhs did not command a sufficient population

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4(government files. Department of Land Use and Rural Water Development.)

to raise the manpower needed for constructing hafirs. Renewed increase of population further reduced the authority of the traditional tribal leaders because of the number of immigrants over whom they had little control. Their responsibilities were not assumed by village heads, many of whom wielded nebulous authority over communities of very mixed tribal origin. The decline in tribal and village authority was accentuated by a greater freedom and mobility of population. People would not build a hafir if they could move to a village which already had one. Nor were they eager to construct a water-point if its water was going to be used by villagers who had gone off in the dry season and had not helped with the work.

Moreover, since the government was prepared to open up water-points to assist the development of the country, the local people saw no point in doing the work themselves. The benevolent bureaucracy of the Anglo-Egyptian administration doubtless did much to stifle local initiative.

THE MAINTENANCE OF WATER POINTS.

Before the Mahdia the people maintained their own wells and hafirs. Since then responsibility has increasingly devolved upon government authorities, although not to such

an extent as in the construction of water-points.

Hafirs were originally repaired by the whole community. The work was usually done on Fridays after attendance at the mosque. Gradually, however, as the government was seen to provide hafirs, so the population expected it to maintain them. (After the Mahdia, the people themselves built almost no new hafirs.) By 1933 Major Evans was complaining that "the inhabitants of Gedaref District were extremely idle about cleaning out the many large hafirs which the government constructed at such great expense some four or five years ago"[5] Today villagers occasionally desilt their hafirs if it is clear that the council's maintenance teams will not reach them before the rains.

While the repair of hafirs requires many labourers and considerable organization, the work of cleaning wells involves only three or four people. Perhaps for this reason the local people usually keep their wells in good condition themselves. The cleaning, which is carried out every few years, is supervised by the sheikh. Major repairs, however, are automatically assumed to be the work of the rural council employees.

Failure to maintain their hafirs adequately results in periodic shortagesof water in certain villages. Where

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5(government files. Administrative Offices, Gedaref.)

hafirs are badly silted through neglect, villages may even have to resort to an unnecessarily migrant way of life. There are several examples of settled villages with wells that have fallen in, where, rather than rebuild their wells themselves, the villagers have fetched water from several miles away. The people living in the old Dubanya camp at Assar waited twenty-two years for the rural council to repair their well, although they were competent to do the work themselves.

This reliance on the inadequate repair teams of the councils is unrealistic, particularly considering the expense involved in transporting council labourers to remote villages. Maintenance, except of mechanically excavated hafirs and bores is unskilled work.[6] If villagers used the free time they have in the dry season to maintain their water-points regularly, water supplies in many villages would improve and some villages might even be able to adopt a more settled way of life.

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6 (Mechanized hafirs and bores require specialized maintenance. It is carried out by trained teams employed by the central government departments concerned).

2) CUSTOMARY RIGHTS TO THE USE OF WATER.

Customs about the right to use water affect the ways of life of many of those living in Gedaref. Even more, these customs determine grazing patterns for the beasts of the area.

Attitudes to water are deeply influenced by Moslem traditions and teaching. In Islam the gift of water, which was originally regarded as an act of religious charity, has often become a legal obligation.

The generally accepted order of precedence for those wishing to drink at a privately-owned water-point is as follows:-[7]

1) Persons who are thirsty.
2) The owner of the water-point.
3) Travellers.
4) The local people.
5) Animals belonging to the owner of the water-point.
6) Animals belonging to travellers.
7) Animals belonging to the local people.

Within this accepted framework, private owners have some choice as to how they dispose of their water. In Gedaref,

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[7] (Caponera, 1954:p.20)

privately-owned water-points belong to the individuals or the communities who made them or paid for their construction. Many water-points in the District, however, are not privately-owned. Those which have been provided by the local councils or the central government belong to the people of the District as a whole. They can all use the water freely, although the village where the water-point is established may have prior rights.

Both villagers and individual well-owners allow travellers to drink at their water-points. They either draw water for them or provide them with the necessary vessels to draw water. They also allow members of less fortunate villages to share their water in the dry season, even if it means that they themselves are short of water. Where a village has split as the result of a quarrel, the splinter group often has no water-point of its own. It continues to use its old water-point. Recognizing the right of everyone to water, the parent village never attempts to stop the dissidents from obtaining water (see the village study of Um Khanjar). The poor from neighbouring communities are permitted to share the meagre yield of a village's well, even when the wealthier members of that village have resorted to fetching water from

further off. In the dry season the poor from Hassan join the poor of Wad es Said in drawing water from Wad es Said's well. Meanwhile the rest of Wad es Said are making a daily journey of several miles to fetch water by donkey, or are buying water from trucks.

Indeed, when a village water-point shows signs of running short, the wealthier villagers use their animals to fetch water from elsewhere, in preference to waiting several hours to obtain water from the village well. Their action enables the poor, who have no animals, to use such water as seeps slowly into the well. By this means the ten or so really poor families in a village may be able to obtain water and remain in the village throughout the dry season.

In Gedaref people always take precedence over animals. In practice this often means that animals and men obtain water from different water-points. Where a well is known to run short in the dry season, animals will probably never be watered at it. Beasts usually use pools in the rains. They are then sent to hand-dug hafirs. When these are exhausted, they will move to a more adequate water-point beyond the village. Animals are actually forbidden to drink at certain mechanized hafirs which the councils feel are barely adequate to last the local people throughout the dry season (see village study of Abu Kashma[redacted]).

As noted before, however, animals take precedence over gardens as recipients of water. At Assar a gardener was expected to use his saqia to provide stock with water to the detriment of his vegetables. Yet the local wells had ample water for cattle. The herdsmen simply refused to draw it themselves.

Water available for animals is shared in the same way as water for human consumption. Most of the hand-dug hafirs, where beasts drink at the beginning of the dry season, are privately owned by the villagers, who built them. Yet these villagers share their water with herds from other villages, even though this means that their own animals will have to leave the village to drink elsewhere sooner than otherwise.

An interesting example occurred at Azaza Misallamiya, which is eight miles from Idd el Tin where its cattle were watered at the height of the dry season. Um Khanjar is a mile from Azaza and only seven miles from Idd el Tin. Um Khanjar's hafir regularly dried up in November. Rather than begin commuting to Idd el Tin, Um Khanjar's herds drank at Azaza. Thus, they forced Azaza's cattle to make the much longer journey to Idd el Tin considerably sooner than if Azaza had kept its water for itself. Although Azaza's cattle lost condition by travelling to Idd el Tin and although the water they drank there had to be paid for, the people of Azaza

did not complain about sharing the last of their water with Um Khanjar's animals. (A rather similar situation occurs today at Abu Kashma, but Abu Kashma's hafir is not privately-owned as Azaza's was).

Nomadic cattle have roughly the same rights to water as local cattle, even if they come from outside the District. In Karadis in the dry season so many come to drink at the bore that some of the local cattle go elsewhere. At Assar one of the gardens specializes in providing water for nomads. They have traditional rights to water at certain old nomadic well centres. Most of these water-points have now attracted settlers. Luckily there is ample water at these places and villagers can without hardship honour the rights of nomads to water their stock there. Thus clashes of interest between settlers and nomads over the rights of stock to share water-points used by humans have so far been avoided.

Customs relating to the use of water in Gedaref show that water is generally regarded as a public utility, available to all who need it. This is a view one would expect to find where water is plentiful. It is remarkable in Gedaref, where water is scarce. Here people are prepared to share even privately-owned water supplies, in the very conditions in which they might be expected to conserve it.

This attitude to water enables a much fuller use to be made of the water resources of the area than would be possible if the population had stronger concepts of private ownership.

3) WATER FOR ANIMALS.

The amount of water drunk by beasts, the frequency of watering them, and the distance they can travel to water influence grazing patterns throughout the area.

Grabham[8] quoted estimates made in Kordofan which showed that animals required the following amounts of water:-

FIGURE 110 AMOUNT OF WATER DRUNK BY DOMESTIC ANIMALS.

Animal	Amount drunk in gallons	Frequency of watering
Camels	22.7	every four days
cattle	10.0	every two days
donkey	4.0	daily
goats	2.0	daily

Preferably all animals, except camels, should be watered daily. Watered daily, cattle drink rather more, about six and a half gallons a time, but remain in much better condition. The watering of stock animals is not usually a problem. Donkeys can drink daily at the dry-season's water-point while fetching the household's water. In Gedaref camels are usually watered every five days (they then drink a few gallons more than if watered every four days). They can fetch forest produce from the remotest parts of the area between waterings.

The watering of stock, however, may be difficult. Goats

8 (Grabham, 1927.)

cannot manage a round-trip of more than about five miles daily to water. If the water-point is more than two-and a-half miles away, each family may keep a few goats at home. These are watered from household supplies, providing this does not involve the householder in additional journeys to fetch water. Very rarely goats may be watered every two days and made to walk to a water-point five or even six miles away, but though they remain alive, they cannot give milk under these conditions, and would in fact do better if they were transhumant. Cows can manage a round-trip of about seven miles daily. Where the water-point is further than three and a half miles away, cattle are watered every two days. Particularly among villages on the edge of the Ridge, this is quite a common practice. Where the nearest water is more than seven miles off, however, beasts are normally sent away.

During the dry season the watering of animals often costs money. In the rains animals drink free from pools, hand-dug hafirs or public wells. Later, however, these sources are exhausted, or in the case of public wells, closed to stocks. Bores, private wells and certain mechanized hafirs are made available to animals, but only at the hafirs can they be watered free. Elsewhere charges are made for drawing the water and for providing drinking facilities. Private well-

owners often provide a pump or saqia. Alternatively, a bull or camel may be used to haul ox-skins full of water from wells by means of a pulley. Quantities of water required by animals are so large that the owner of the water-point usually finds it worth-while to install some form of lifting device and appoint a man to manage it. (fig.111).

Charges for watering animals at various water-points are as follows :-

Figure 112. CHARGES FOR WATERING DOMESTIC ANIMALS.

Animals.	Charge per head if watered from Deep bores	Private wells
Camels (per drink)	.8 P.T.	.5-1.0 P.T.
donkeys (per month)	6 P.T.	often free if fetching water
cattle (" ")	12 P.T.	8.5-12.5 P.T.
goats (" ")	3 P.T.	often free or 2-3 P.T

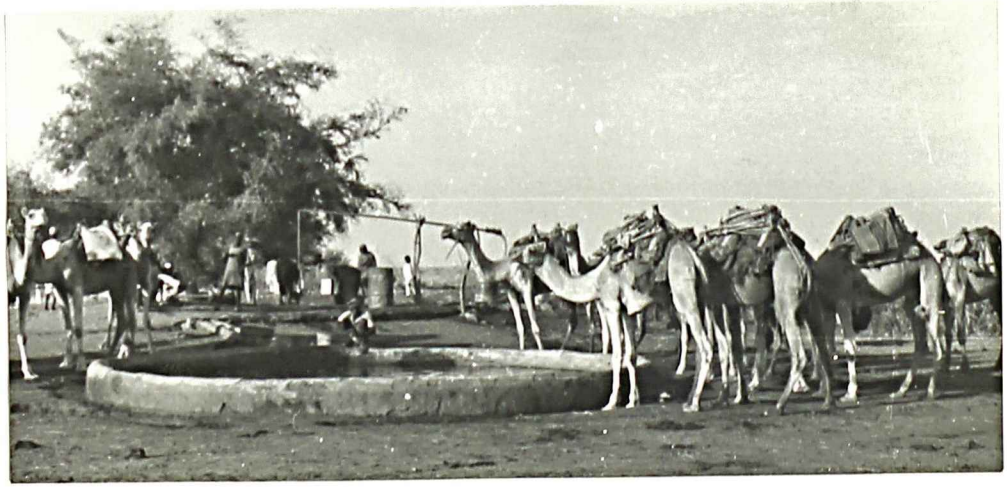
It is therefore by no means cheap to water a large number of animals by this method throughout the dry season. Thus excess animals, particularly cattle, are likely to be sent to the river or to some other place where they can drink free.

ATTITUDES TO STOCK.

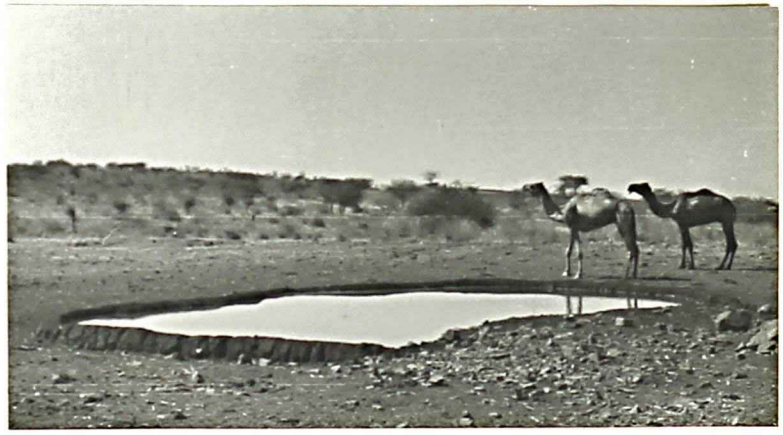
When cattle and goats are kept at home, this is usually because they are supplying milk. Yet cows may provide as little as a quart a day during much of the dry season. With

FIGURE 110 WATER FOR STOCK

Overgrazed country round a group of wells at the centre of the Ridge



Nomads watering at an irrigated garden. The gardener provides water in a modern concrete trough, pumped and led by pipe from his well



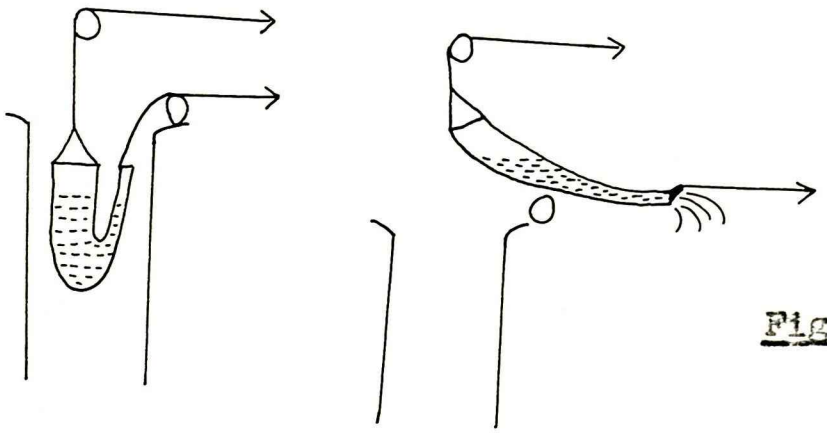


Figure 111 cont. Using Ox-skin to draw water

their low water/milk conversion ratio it is not surprising that these animals occupy a low position in the "pecking order" of rights to use scarce water resources. The ratio is low because cattle usually have to walk far to obtain dry season grazing and water, thus using up their energy. Because goats drink so much less and are generally kept only in ones and twos, they can often be watered, and even fed at home, if the nearest water-point lies beyond the village. They thus have a much better conversion ratio and are more suitable as providors of milk.

There is, therefore, a fundamental difference in attitude towards goats and cows. The possession of a goat or two to provide milk is regarded as an essential part of any household. They eat anything and drink little, and so every effort is made to retain them in the village in the dry season. When a village is transhumant, water shortage may force the goats to leave for the dry season camp before the people follow at the end of harvest, but apart from this, it is rare for goats to be separated from their households. Occasionally, in villages such as Mugdeit or Bea, where large numbers of goats are kept as a partial substitute for cattle,

the main herd may be transhumant for the worst part of the dry season. Villagers retain only a few milk animals. When watered at home out of household supplies, goats receive water free of charge. Goats are allowed to be watered from certain village wells in the dry season, although cattle are refused. Even men who make money by watering stock from their private wells may allow goats as well as people to drink freely.

In comparison cattle are not considered such essential beasts. In many villages they are the prerogative of the rich, who may have a large number of stock. The community as a whole has no wish to allocate scarce water resources to them. Their demands in terms of water and grazing are often so great that they cannot be met locally. Thus, over 45 per cent of the villages possessing cattle have to send most of them away for part of the year.

CLASSIFICATION OF GRAZING PATTERNS.

The most common grazing patterns may be classified as follows:-

1) Nomadic
2) Transhumant
3) Local
4) Home

1) Nomadic[9] Cattle spend most of the year travelling with a group of nomads. The rains are normally spent in Butana. The cattle return to their villages for the first part of the dry season for periods ranging from a few weeks to a few months. When water supplies dry out, the stock leave for their dry season camp at one of the rivers. With the first rains the herd returns briefly to its village, later moving to Butana before rain makes the clays impassable. For nomadic cattle from the Rahad, the two visits to the village and the dry season sojourn at the river coincide.

2) Transhumant. Cattle pass the rains in their villages, moving to an established dry season camp, almost always by one of the rivers, when village water supplies grow inadequate.

3) Local. Cattle are watered at their village in the rains. In the dry season they travel daily or every two days to drink at a more adequate water-point in the neighbourhood.

4) Home. Cattle are watered in their villages throughout the year.

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9 In this section only nomadic stock belonging to settled villagers are considered. Cattle belonging to nomads are included in an assessment of the nomadic way of life in the next chapter.

DISTRIBUTION OF GRAZING PATTERNS BY AREA.

The different areas of settlement in Gedaref have water supplies of differing degrees of adequacy. Since the traditional movements of cattle have evolved largely in response to scarce water supplies, certain grazing patterns are especially typical of certain parts of the District. Migrations of stock, however, are also made in response to other stimuli. Moves may be made away from areas that are seasonally unhealthy, or in search of better grazing rather than more water.

Figure 113 shows the percentage of villages within each region whose beasts practice the main forms of movement.

FIGURE 113. MOVEMENTS MADE BY CATTLE FROM THE VARIOUS SETTLEMENT AREAS.

Percentages of villages with cattle making these movements.	Type of Movement				Villages without cattle
	Nomadic	Transhumant	Local	Home	
North Ridge	15	24	35	20	6
South Ridge	0	7	39	41	13
Nahl Hills	13	56	0	1	30
R.Rahad	22	0	0	36	42
The Plains [1]	0	13	25	23	39

Note [1] The figures for the Plains refer only to dry season movements. All cattle in the M.C.P.S. have to graze outside it in the rains. They thus all practice transhumance in the rainy season, in addition to any dry season movements they may make.

The nomadic movements found in the Ridge and Hills are the result of a combination of factors. In the rains it is

worth sending large herds off to Butana to be free of flies, and protect growing crops, while in the dry season absence of water makes a move to the river essential. The situation is the same in the M.C.P.S. where the absence of grazing lands in areas surrounded by schemes means that cattle must leave the area during the cultivation period. At the Rahad the nomadic movement occurs only during the rains, when the river area is unhealthy for beasts.

All transhumant movements are undertaken in search of water. Transhumance is most typically found in the Hills where many of the people are, or were, also transhumant. Over half the villages with animals practicing transhumance are found here. Local movements, too, are made in response to scarce water supplies. As with the human population, movements of this kind are most typical of the Ridge, where 90 per cent of the villages with cattle making this movement are found. The general superiority of water supplies in the Ridge is shown by the fact that over half the villages whose cows drink at home all year are found here.

Absence of cattle reflects not only the water supply situation but also the tribal origins of the people in the area. Thus the highest proportion of villages without cows

is found, not in the driest areas of the Hills and North Ridge, but at the river, where the settlers are recent western immigrants with little time or capital for the accumulation of stock, and with no tradition of cattle ownership.

ASSESSMENT OF GRAZING PATTERNS.

Inasmuch as beasts are seldom kept for purely economic reasons it is difficult to evaluate the various grazing patterns used in the area by ordinary commercial standards.

Nomadic methods of extensive ranging undoubtedly enables the best use to be made of grazing in situations where water scarcity or other factors necessitate movement. By providing adequate fodder and water through movement, and by avoiding unhealthy areas at certain seasons, animals can be kept in good condition. Arrangements for cattle to go off with a nomadic group are most easily made by fellow Arabs and it will be well worth while if there are large numbers of cattle. Beasts kept in this way are usually regarded as a prestige symbol and a capital investment (with cumulative interest in the form of young stock). The cattle may or may

not contibute to providing a regular milk supply. In extreme cases stock are at home for only two short periods of several weeks each year. Along the Rahad, however, cattle are at home throughout the dry season. In much of the Ridge they spend several months in their villages after harvest. In villages where cattle are nomadic and men transhumant, men and beasts will come together at the dry season camp, and villagers have the benefit of animal products.

In settlements where men and animals are both transhumant, cattle can supply milk for most of the year, except for the two brief periods when they, but not the human population, are at their dry season camp. Even when beasts, but not men, are transhumant, villagers have the benefit of milk during the rains when work is hardest, the need for food greatest and the supply of milk at its best.

For the owners of most transhumant and nomadic cattle, the chief problem is that of feeding stock in the dry season. Particularly in the last few months before the rains the riverain environments of the Atbara and Rahad become crowded with animals and grazing is very scarce. The condition of stock at the end of the dry season is in inverse ratio to the length of time they have to spend at the rivers. The better the home water supplies, the longer cattle can graze the generally under-utilized pastures around the village.

Where cattle drink locally throughout the year, the problem is reversed. Far from being under-grazed, the pastures lying within a few miles of the village and the dry season watering-place form the sole source of grazing throughout the year. Where animals drink at a water-point several miles from the village, much of their time and energy is spent walking to water. Because there is little time for grazing, beasts cannot stray far from the route to water, which soon becomes bare of vegetation (see fig.111). Animals suffer from a lack of grass rather than lack of water. Thus in 1960, when Shasheina's water supplies failed and its cattle had to make the eleven mile journey to Assar to drink, many died from slow starvation as the result of several months of increasing under-nutrition. Even when the situation is not as bad as this, cattle making daily movements for water generally lose condition in the dry season. Milk yields are often negligible towards the end, and it might therefore seem to be more practical to send the animals away. Animals which are watered in their home villages all the year are in a somewhat better position. They are able to graze a much wider area than cattle which walk to water. They produce larger quantities of milk for their owners throughout the year. The grazing problem for both 'home' and 'local' cattle is accentuated by the fact

that where water supplies are adequate throughout the year, people are encouraged to keep many animals. Yet in these areas the human population is high, and thus a high proportion of the surrounding land is cultivated. Large numbers of beasts are compelled to graze a relatively small area. These high stock densities may cause owners of a large number of cattle to send the majority away with the nomads, retaining only a few for personal use. This is in many ways a satisfactory solution. Stock and breed animals have the benefit of better grazing further afield, while the owner still has an adequate all-year milk supply.

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CHAPTER X.

WATER FOR PEOPLE.

1) AMOUNTS OF WATER USED.

In assessing the relation between a settlement and its water supplies it is necessary to estimate the daily water requirements of its population. There have been no previous attempts to measure this in Sudan[1].

In order to make a quantitative study of water consumed, seven villages were surveyed. Four had ample all-year water supplies, two from hafirs, one from a well and one from the river. The others were two, three and six miles from the nearest water-point during the dry season. The new hafir villages of Abu Hamir and Abu Kashma, the old Dubanya camp at the well-head of Assar and Huweig, a new Western Sudanese village on the edge of the Nahl Hills, have already been described. (see village studies). Arzuga is a well-established

[1] Mrs Culwick, (1955:p.79) thought that Gezira tenants used about four gallons a head. Government construction units provide this amount for their labourers. The Department of Land Use and Rural Water Development, 1960: p.4, however, estimates that in provinces away from the Nile, including Kassala, average per capita daily consumption is less than two gallons.

Hausa village on the Rahad. Bea is one of the oldest Arab villages in the Nahl Hills. When its granite wells dried it used to be transhumant. Now it depends on a mechanized hafir two miles away in the clays for its dry season water supplies. Hagokat is a pre-Mahdia Jaalin village in the North of the Ridge. It has temporary water supplies from low yielding wells in the basalt. In the dry season its people have to travel six miles to a well-field on the crest of the ridge.

Figure 114 shows the amounts used. Generally agricultural workers and pioneer settlers use less than other groups even when water supplies are freely available (c.f. Abu Hamir and Abu Kashma). This may be because they contain so many single men. They have to fetch their own water as well as do other household chores after the day's work is over. Naturally they fetch no more water than is necessary. In West African villages it is socially degrading for women to fetch water. As in new hafir villages, the farmers themselves usually have to get it. They fetch the minimum required by their families, and consumption per head is consequently low (c.f.Arzuga).

West Africans and Western Sudanese are generally considered dirty by Arabs and the figures for Abu Kashma, Abu Hamir and Arzuga seem to support this idea. It appears, however, that the consumption of water may be connected with family structure. The presence of women and children tends to

FIGURE 114.

DAILY PER CAPITA CONSUMPTION OF WATER IN THE DRY SEASON AT SELECTED VILLAGES.

Villages with plenty of water.	Gallons.
Dubanya camp Assar	3.63
Arzuga	3.38
Abu Kashma	3.32
Abu Hamir [1]	3.28
Villages which are short of water.	
Bea	4.12
Huweig	3.98
Hagokat (when obtaining water from six miles away)	2.82
(when obtaining water from their own village before January)	3.96
Water used by agricultural labourers	
At Bea	3.35
At Huweig	3.98
At Hagokat	3.28

Note[1] The figure for Abu Hamir is probably an underestimate of the water consumed. It includes only water used in the home, not what is drunk in the beer parlours.

raise living standards. Moreover established households often have chickens and sometimes goats, which may drink in the house, using water obtained for the family, thereby increasing the apparent per capita consumption. Thus West Africans in the well-established village of Arzuga use more than their fellow countrymen at Abu Kashma, where families are smaller. Among Western Sudanese, the people of Huweig with their well-developed family structure use more water than those at Abu Hamir, although they have to go further to obtain it.

The amount of water used does not necessarily seem to decrease with distance. Of two long established Arab villages, Bea, two miles from water, has a higher per capita consumption than Assar, with water available in the village. Average per capita daily consumption at Huweig, however, decreases by over a gallon when water has to be fetched from six miles away. Yet, several families actually show an increase in consumption during the latter part of the dry season. This is the result of different methods used to fetch water. In Huweig, water is collected in parafin tins, about 3½ gallons at a time, as it is needed. Fetching water from six miles away requires a donkey and a kurrug(pannier for carrying water), which holds seventeen gallons. Although the family may need only three or four tins of water daily, there is no point in bringing back a

partially empty kurrug. In Huweig the average consumption of water actually increases slightly when wives and children leave. Sometimes the departure of these dependents means that men can make fewer journeys to fetch water. More often, however, the same number of journeys has to be made, and so there is more water per head for those who have stayed.

The amount used at Hagokat, 2:82 gallons per head daily - seems to represent about the minimum acceptable to the people of the area. Three years ago two-thirds of the village left, and settled permanently beside its dry season water-point. Despite strong sentimental ties to their old village, they were not prepared either to continue making such stringent economies in their use of water, or to go on fetching it such a distance throughout the dry season.

What emerges most clearly from the tables is that the demand for water is very inelastic. A certain amount is required for drinking, cooking, personal washing and household cleaning. During a brief period of unexpected shortage, however, some economies can be made. Standards of hygiene can be disregarded and methods of cooking altered. Clothes can be carried to the water-point to be laundered. But in the long-run, people are generally not prepared to economize in their accustomed use of water.

In the same way as relatively few economies can be made if water is scarce, its consumption does not greatly increase

if it is in ample supply. However near the water is, the sheer effort of fetching it, or of paying others to do so, seems to deter extravagence. Traditional methods of housekeeping are based on an economical use of water. Using these techniques, housewives have little need of additional supplies.

In Gedaref it is generally assumed that a person requires a tin, or about 36 gallons, of water a day. Single men normally fetch a tinful daily, and even if it is slightly more than they need, it is not considered possible to make a tin last for two days. A husband, wife and small baby may manage on two tins, if fetching a third involves them in an extra journey to the water-point. Children, however, usually require as much water as adults because they and their clothes have to be washed more frequently.

Particularly where the water-point is far away, some families prefer to use less than the average amount of water rather than make additional journeys to fetch more. It is incredibly rare, however, to find a household where water consumption is less than two-thirds of the average for the village, and relatively unusual to find one where consumption exceeds one and a half tinfuls (54 gallons) a head.

The most scant use of water noticed in the area was not,

in fact, the result of water shortage as such, but of saltiness. In the spring of 1961 the concentration of salts in the well-water at Balos was so high that many people moved to the river rather than drink it. Those left could swallow the water only when it was flavoured with tea or coffee. They were using less than 1/2 gallons a day.

Exceptions such as these are rare and do not detract from the general estimate of water required. Knowing the amount of water considered necessary, it is now possible to turn to the problem of fetching this water.

2) THE FETCHERS OF WATER.

The methods used to fetch water depend partly on social customs and partly on the ease with which water can be obtained.

The most common receptacles used to hold water and their approximate capacities are as follows:-

FIGURE 115. WATER CONTAINERS.

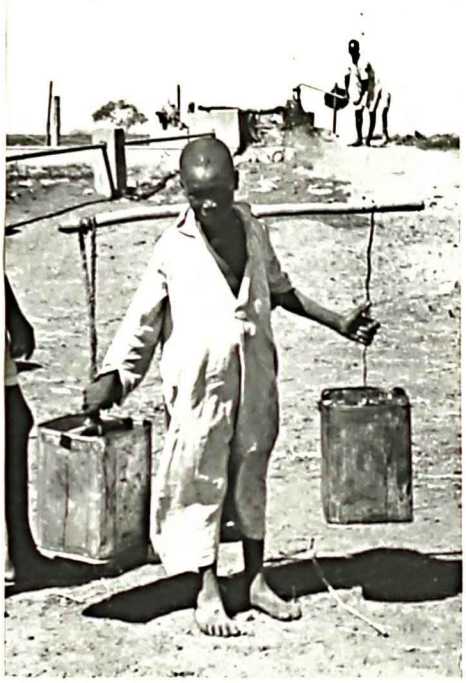
Enamel bucket	2.2 gallons.
Paraffin tin or sufiya	3.6 "
Goatskin bag or girba	5.4-8.1 "
Canvas or leather panniers or kurrug	16.2-18.0 "
Aircraft tanks	10.0 "
Petrol drums	40.0 "

(these figures allow for a loss by evaporation of 10 per cent from all canvas and leather receptacles. A similar loss from splashing has been deducted from all open metal containers. These losses would occur during an average journey of four miles. Over a longer distance they would be greater).

Boys and girls usually carry a bucket. Women and men manage a tin. A donkey laden with a kurrug, or a combination of two tins and a girba will carry rather over sixteen gallons. Camels carrying aircraft tanks and girbas can transport up to fifty gallons. (fig.116).

Where the water-point is within the village, social conventions may permit women to fetch water, leaving men free for other pursuits. West Africans and strict Moslems may be

FIGURE 116 CONTAINERS FOR WATER



Safiya yoked

Donkeys laden with kurrug

Filling girbas

Drawing water from a well with a leather bucket

reluctant to let their wives be seen fetching water although they may allow elderly relatives or young girls to fetch it. Among Arabs the least busy partner usually gets the water, and if much is needed husband and wife may share the task. Western Sudanese, however, regard fetching water as strictly women's work. (fig.117).

If the water is hard to obtain, men fetch it. Thus, where a village well is over thirty metres deep women seldom perform the heavy work of drawing. Timings made at a well forty-five metres deep showed that considerable effort was required to draw water from this depth. It took 90-130 seconds to raise, empty,lower and submerge a leather bucket with a capacity of $1\frac{3}{4}$ gallons. Every two or three withdrawals men were forced to rest.

Nor are women expected to fetch water from any considerable distance. Women from Hagokat never get water from the well half a mile away. Mugdeit's women fetch it from Ban's wells, a quarter of a mile away, but not from Ban's hafir, which is twice as far. The journey to the hafir involves social problems, for women making it would be seen by strangers from other villages. The Arabs of Hassan would not let their women fetch water from the well a third of a mile away, partly, it seems, on account of the distance, and partly because they would be seen by members of an immigrant group.

FIGURE 117.

METHODS OF OBTAINING WATER.

1) VILLAGES WITH THEIR OWN WATER SUPPLIES.

A) Kabaros (Western Sudanese)

Number of families where men fetched water	9
" " " " women " "	21
" " " buying water	3
Total:	33

Note. The men fetching their own water were all unmarried.

B) Hagokat (Arab) July to December

Number of families where men fetched water	21
" " " " women " "	14
" " " "men and women " "	11
Total:	46

C) Fulani Calipha (West African)
(the pool where water is obtained is on the edge of the village).

Number of families where men fetched water	6
" " " " sons " "	7
" " " buying water	9
Total:	22

Number of above families using donkeys 7

Like women, boys are not usually entrusted with fetching water from far off. Although 33 per cent of the households in the Fulani community at Calipha use boys to fetch water from the edge of the village, in Bea, where water is two miles away only six per cent send their sons. In Hagokat, boys fetch water only if their fathers are unable to go.

As the distance to the water-point increases so it becomes more desirable to have an animal to carry the water. Where the water-point is within the village only professional water-carriers bother to use a donkey. Once the water-point is beyond the village, it is worth while for any consumer to use one. Thus, while about 70 per cent of the Fulani people of Calipha carried their own water only 6 per cent of the people of Bea carried their families' supplies themselves (see fig.117 and fig.118). Hagokat, six miles from water in the dry season, some form of transport animal is essential if people are to remain in the village in the dry season. Where a village is more than about three miles from water, one of the most important factors determining whether that village becomes transhumant or remains settled is the possession of adequate numbers of beasts of burden. Arab and other old-established villages, like Hagokat and Hassan, usually have enough animals, whereas newer Western Sudanese and West African

FIGURE 118.

2) VILLAGES WHERE WATER SUPPLIES ARE FURTHER OFF IN THE DRY SEASON.

A) Hassan (a third of a mile from a water-point) November-February.

Families using donkeys and camels to fetch water	3
" " their own donkeys " " "	41
" borrowing donkeys " " "	3
" where the men carry the water themselves	1
" buying water	6
Total	54

Number of journeys daily.	Number of families making them
One	5
Two	24
Three	12
Four or more	13
Total	54

B) Bea (two miles from a water-point)

Method of fetching water

Families using camels	4	
" " donkeys	26	(accompanied by a boy in three cases)
" where men carry water themselves	2	
Families buying water	17	
Total	49	

Number of journeys daily.	Made by:- Camels	Donkeys	Men
One	0	9	0
Two	1	11	1
Three	1	7	1
Four	2	5	0
	4	26	2

C) Huweig (three miles from a water-point)

Number of journeys	Made by:- Donkeys	Men
One every two days	7	0
One daily "	7	1
Two "	2	7
Three "	0	5
Four "	0	3
	16	16

FIGURE 118 (contd.)

D) Hagokat (six miles from a water-point)

Number of Journeys	Made by:- Camels	Donkeys
One every three days	1	0
One every two days	10	2
One daily	9	22
	20	24

villages do not. Even when pilgrims have the four or more pounds needed to buy a donkey or the thirty odd pounds required for a camel, they may not wish to lock up their capital in this way. Beasts used for fetching water from afar in the dry season seldom have the time or energy to perform more profitable transport jobs. It is significant that most of the forest products coming into Gedaref Town from the north are brought in by nomads rather than by members of outlying villages, where beasts are fully occupied with the daily drudgery of fetching water. Only half the members of the new Western Sudanese village of Huweig have transport animals. Without strong economic motives to stay, the men as well as the women and children of the village would doubtless become transhumant.

Although it takes longer to load camels, they carry more than donkeys. They also travel farther and faster. Hence they are most used in Hagokat, the village which is furthest from water. Donkeys cannot manage a round-trip of more than about twelve miles daily. Camels can travel twice this distance. Even in Arab villages not everyone owns camels, however, and if a village is more than six miles from its dry season water-point it normally becomes transhumant, unless it receives its water by truck.

Figure 119 summarizes the methods used to fetch water.

FIGURE 119

ABU HAMIR. FETCHERS OF WATER
(May 11th, 1961)

Fetchers of water	Coming from - Abu Hamir	Farms	El Agarr (2 miles)	Ban (5 mls)	Buweida (6 mls)	Bea (7½ mls)
Girls	12	0	0	0	0	0
Women	25	0	0	0	0	0
Men	10	3	0	0	0	0
Men using donkeys	32 [1]	8	7	49 [2]	49	4 [3]
Men using camels	0	0	0	8	12	1
Other methods	0	0	0	Tractor	0	Cart
	79	11	7	60	61	6

Notes

1 The hafir is about a third of a mile from the furthest houses so it is worth while to load up a donkey. Many of those using donkeys borrowed them.

2 This figure includes six boys who came with donkeys because their fathers were not able to do so.

3 The donkeys could barely manage the fifteen-mile round-trip. Only in exceptional circumstances are they made to carry water as far as this.

It shows how four villages and several groups of agricultural labourers, living at various distances from Abu Hamir, obtained their water from the hafir on 11th May, 1961. Nobody carried his water himself except people from Abu Hamir and the nearest labourers. The three furthest villages used camels as well as donkeys. In addition the religious head of Bea, with over twenty dependents, used a horse and cart, on which was mounted a petrol drum. The khalifa, not too religious to indulge in commerce, sent his tractor towing a water cart, with a capacity of a hundred gallons, thrice daily to fetch water to sell to the people of Ban. (Fig.120).

TIME SPENT COLLECTING WATER.

In the dry season many hours a day may be spent fetching the family water. Usually it is the head of the household who spends his time doing this, when he could, theoretically at least, be otherwise occupied in gainful employment.

Fetching water takes time even when the water-point is not crowded. At Abu Hamir men from outlying villages spent at least twenty minutes and often as much as three-quarters of an hour at the hafir. This time allowed for soaking and filling leather water containers, washing, watering a camel or donkey and exchanging essential gossip. Donkeys travel

at about three miles an hour, and camels a little faster. Thus a single journey to fetch water from four miles away takes nearly three and a half hours.

Yet the surveys showed that many families had to make more than one daily journey to fetch water. Indeed, 54 per cent of the villagers of Huweig, almost sixty per cent of Bea and ninety per cent of Hassan made more than two trips to fetch water each day. The number of journeys mattered least to Hassan, where the water-point was not far off. On the other hand, the people of Hagokat physically cannot make more than one journey daily. Figure 118 shows that with the use of camels, 27 per cent of the men fetch water every other day, thereby freeing at least one day in two for other matters.

Even supervising the cleaning of fields and the picking of gum is difficult when water has to be fetched from afar. Any more specific and profitable dry season occupation is usually impossible. Thus only those with adequate resources to tide them over between agricultural seasons - and they are mainly Arabs - can afford to spend their dry seasons fetching water. Others have to leave the village and seek jobs elsewhere.

THE COST OF HAVING WATER FETCHED.

In most larger settlements it is possible to pay to have water delivered. Even when there is ample water available

within a village, the rich may prefer to buy their water rather than fetch it themselves. At well-established Western Sudanese, Arab and West African villages, the proportions of families buying water were nine, eleven and 38 per cent respectively. (see fig.117, Kabaros and Fulani Calipha, and fig.118, Hassan).

As distance from the water-point increases, so more people are prepared to pay for water, because the task of fetching it becomes more arduous. At Bea, thirty-five per cent bought their water. This figure included not only the rich but also the very poor, who had no donkeys to carry their water. Paying for water was a heavy drain on their meagre resources, and served to increase their poverty.

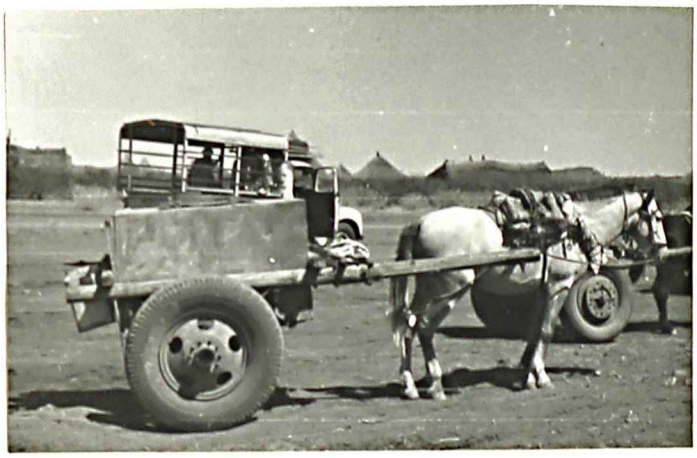
Thus it is generally impractical for people who are unable to fetch their own water to attempt to stay in their village in the dry season. Villagers may, of course, have economic or social reasons for staying. They may feel justified in buying water rather than migrating. Many Arabs from old-established villages willingly pay for water rather than leave the home of their forefathers to become transhumant.

In Hagokat and Hassan, however, the time required to water a single family is so great that there is nobody prepared to fetch water for others. If either village were on a through

road it would almost certainly be partly supplied with water by commercial truck, as Hassan is in the last months of the dry season. Owing to the expense few buy water from trucks for more than two or three months. If village water supplies are inadequate for only a few weeks, however, it may be worth-while to buy water during this brief period rather than incur the cost and inconvenience of moving. (fig.120)

Figure 121 shows the prices charged for delivering water by various means and from various distances. Since water itself is free the payment is for drawing and transporting the water. The price itself is dependent on the time taken to obtain water. This in turn reflects scarcity of supply. Thus, a District Officer wrote of Godaref Town "The price of water is in direct relation to the time taken to get the water out of wells. The longer it takes the fewer kurrugs available for sale and the higher the price." Water-carriers in the town normally charge 0.5 P.T. a tin for delivering water, having obtained it drawn from private wells at 0.15 P.T. a tin. They distribute five forty-gallon drums a day, earning a daily gross income of 25 P.T. In May, 1961, water was short. The slow recharge at wells meant that it took longer to get water. Only two or three drums could be delivered daily. In order to maintain their incomes the

FIGURE 120 PROFESSIONAL WATER-CARRIERS



Water carts Gedaref Town

Loading a commercial truck with water in an emergency

FIGURE 121.

CHARGES FOR DRAWING AND DELIVERING WATER.

Source of water.	Charge per tin(3.6 gals).
Private wells Gedaref Town[1] (drawing only)	0.15 P.T.
Deep bores (drawing only)	0.33 P.T.
Delivered by donkey from water-point in village	0.4 P.T.
Delivered by donkey from water-point 1-2½ miles away	2.0 P.T.
Delivered by donkey from 3-6 miles away	3.0 P.T.
Delivered by government truck	2.0 P.T.
Delivered by commercial truck	2.5-3.5 P.T.
Exploitation prices (Delivered by truck)	5-10 P.T.
(Drawn from well)	5-7 P.T.

Note[1] Except in the Town, water is normally drawn for people free of charge by the owner of a private well.

FIGURE 122.

MONTHLY COST OF WATER FOR A FAMILY HAVING FIVE TINS (18 gals.) DELIVERED DAILY.

Cost per tin	Monthly total
0.4 P.T.	60 P.T.
2.0 P.T.	3.0 L.S.
3.5 P.T.	5.35 L.S.
5.0 P.T.	7.5 L.S.

carriers struck for a higher price. Eventually they were allowed to charge 1.5 P.T. a tin.

Occasionally, however, price reflects more than the time element. In the absence of competition water-carriers may exploit a village during a time of unexpected water shortage. Thus when yields run low, the unscrupulous may draw water from the wells at night, so that in the morning the well is empty. The drawn water is then offered for sale at prices ranging from five to seven piastres a tin. This happens at both Hassan and Um Khanjar.

In the same way, when hafir villages in the Plains unexpectedly ran out of water in 1961, commercial trucks exploited the situation and sold water at similar rates. The villagers were usually far from alternative water sources. Most lacked animals to carry supplies. Having made no plans to migrate, they were easily exploited. Not only were the prices charged by the trucks high but the supply was unreliable. Water was not delivered if the driver found more profitable loads to haul.

Large villages, with influence, may persuade the rural councils to provide them with water at lower rates, providing the shortage can be classed as unforseeable and non-recurring. Thus in 1961 Gedaref South Rural Council provided over twenty villages with water for the last few months of the dry season.

Figure 122 gives the cost of having water delivered for an average family of six, consuming five tins (or eighteen gallons) a day - a consumption which is low by local standards. It shows clearly that all but the very rich simply cannot afford to do other than leave a village which is going to be exceptionally short of water for more than a few weeks. It shows, too, the relative wealth of the few, mainly Arab, families who can afford to have water fetched throughout the year, particularly when it is remembered that these families usually have about twice the usual number of dependents.

Thus methods of obtaining water affect the whole way of life in the area. Where water has to be fetched from afar, they help to determine whether or not a village will become transhumant. The distance involved, the availability of transport animals or of money to buy water, and the length of time during which village water supplies are short, as well as social and economic considerations are all factors influencing people's decisions to remain or to move in the dry season.

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CHAPTER XI

THE EFFECT OF WATER SUPPLIES ON WAYS OF LIFE AND SETTLEMENT PATTERNS.

Within Gedaref water sources vary widely in their adequacy. So too do the ways of life men have to adopt in response to these varying degrees of water shortage. Where water supplies are plentiful, men can, if they wish, remain in the same place throughout the year. Where water is short people must either economize in their use of it or obtain supplies from elsewhere, even if it involves moving house.

Ways of life within Gedaref can be classified as follows :-

1) Nomadic. People are tent-dwellers. More time is spent moving than by people who are transhumant.

2) Transhumant. People live in villages but spend several months each year in another area.

3) Involving local movements. People live in their villages throughout the year but have to obtain their dry season water supplies from neighbouring water-points.

4) Fully settled. People get their water from water-points within the village all year.

Nomadism represents one of the most extreme adaptations

man can make to cope with limited water supplies. Between the life of the nomad and that of the settled agriculturalist there are many intermediate stages. The categories selected are by no means clear-cut, and it is at the margins that changes in ways of life can most easily occur.

Thus, there is relatively little difference between the nomad who cultivates ih the rains, and transhumant Arabs from the northern hill areas whose cattle spend part of the year in Butana. In a place like Qelbi nomads can join the villagers with relatively little modification in their way of life. In the same way, where a settled village has many men who regularly obtain seasonal employment elsewhere, the whole population can easily become transhumant should the need arise. The regular migrants already have contacts in areas suitable for dry season habitation.

A CRITICAL SUMMARY OF THE VARIOUS WAYS OF LIFE.

1) NOMADISM.

In the past, when techniques used to obtain permanent water supplies were more limited, a much higher proportion of the population of Gedaref District was probably nomadic. In Bruce's day[1] nomads formed the dominant groups. Their mobility

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1 Bruce 1805: VII, pp.325 - 415.

enabled them to make good use of the scattered grazing and water resources of the area and was an additional advantage in unsettled times. Agriculturalists, tied to the few permanent water-points that existed at that period, were an easy prey to bandits and soldiery. Should their fields be destroyed they had no other resources.

Today there are no nomads who have their rainy season camps in the area, but in the dry season many move southwards from Butana. Some travel slowly, pausing for several weeks at each water-point. Others move swiftly to an established dry-season camp, returning to the same place for four to eight months year after year. Southward movement is eventually checked by the Game Reserve, which lies about seventy miles beyond the area studied. Most of the nomads, particularly those with regular dry-season camps, spend the height of the dry-season by a river - the Atbara, Rahad or Dinder. Few hafirs or wells can provide adequate water for large numbers of stock in May or June.

In recent years the number of nomads has probably increased. Some bores have enough water to be suitable as dry-season camps. In the M.C.P.S. stock can use the water left in hafirs after harvest is over. Often this is inadequate for permanent

settlement but is enough to water animals while they graze the surrounding areas.

Nomadism is, indeed, the best way of utilizing a variety of temporary water-points. Moreover, because water supplies support herds for only short periods, the area around water-points is not severely over-grazed. By moving from place to place the best possible use is made of available pasture.

The standards of living enjoyed by nomads, however, are not high. Inevitably they have few material possessions. It is almost impossible to provide them with services, although in the dry season they may occasionally be able to use those supplied to settled villages near their camps.

2) TRANSHUMANCE.

Most transhumance is carried out in response to limited water supplies. Occasionally it is made for economic or other reasons. Traditionally transhumance consists of a movement carried out by entire villages which go regularly to an established camp in the dry-season. The benefit of transhumance as a way of life is its adaptability. It does not matter if rains are unusually poor or particularly heavy. The villagers can move earlier or later than usual. Years of exceptional shortage cause no undue upheaval, although it is awkward if there is no water for the men to use while harvesting. If

water runs short families can be sent on ahead to the dry-season camp. Because the people of the camp all come from the same village and are often related, men do not mind their women and children being on their own there for brief periods, provided a few elderly men act as chaperones.

For the largest group of migrants - those who go from the Nahl Hills to the Rahad - the move has numerous advantages. The people are with their animals and have meat and milk. The riverain lands provide fresh fruit and vegetables, which are not otherwise available in the dry season. With water easily obtainable men have time to undertake dry-season occupations. Arabs usually perform the kind of work which they would have done in the Hills. Among West Africans and Western Sudanese, however, use is made of the opportunities for employment offered by the river, such as fishing and gerf cultivation. A migration made out of necessity is turned to economic advantage and the best possible use is made of two different environments.

The river area also sees a reverse migration of people leaving the Rahad in the rains to cultivate in the Hills. Here crop yields are not reduced by weeds or birds as they are at the river. This movement is undertaken for essentially economic motives, in order to obtain better land. The fact that they and their beasts avoid the unhealthy conditions near the river in the rains is an additional incentive to move. This

aspect of the migration has something in common with the movement of Arab women and children from the southern riverain area into Butana for the rains. This movement is made for reasons of health, and is now practised only by individual families and not on a village scale. As more of the south is cleared of vegetation and becomes less insect-ridden, this migration will doubtless cease.

Similar desires for new land are common in the over-crowded Ridge, but do not usually involve village transhumance. Away from the Ridge, on the clays, water supplies are not usually available. Farmers often spend several weeks at a time living on their fields, bringing their food and water with them. Where there is some water, all the men cultivating locally, will tend to build rough shelters and live together near the water-point. Only where water supplies are exceptionally good will whole families or villages move.

Dry-season transhumance, too, may be undertaken for purely economic reasons. Some people move right out of the District to pick cotton in the Gezira. Most of these are West Africans who want money for the pilgrimage. The availability of water at home has little to do with the decision to seek employment in Blue Nile. Indeed a greater number of pilgrims

go cotton-picking from the Rahad where water supplies are adequate throughout the year than from any other part of the district.

When a transhumant movement is made for economic reasons the whole village is involved. Individual families move as and when they wish. Sometimes only the men go, leaving their families behind. This is the very reverse of the situation which occurs when water supplies are short. Then the women and children are the first to go.

Although villagers, who undertake transhumance for financial gain raise their living standards by increasing their wealth, their home villages seldom have services. It is not worth providing them if the village is nearly empty for over half the year. Where an entire village is transhumant in the traditional manner, it may be possible to arrange for services to move to the dry-season camp with the village. The services will not be available, however, to neighbouring villages which use them in the rains but which do not migrate in the dry season.

3) VILLAGES MAKING LOCAL MOVEMENTS TO OBTAIN WATER.

Local movements to obtain water are usually carried on for from four to six months in the dry season. Villagers travel an average distance of four miles to neighbouring water-points. Generally, the longer the period during which village water supplies are inadequate, and the greater the distance to dry

season water-points, the more prosperous do the inhabitants have to be if they are to continue living in the village.

As shown in Chapter X, where men fetch water from afar in the dry season their farming must be sufficiently profitable to support their families throughout the year, or they have to have additional sources of income such as cattle or gum gardens which need little attention or can be cared for by employees. When a man buys water in order to undertake dry season employment he must deduct the cost of his water from his earnings. In some cases this reduces his profits by over half.

Well-to-do villagers may be prepared to pay for water to avoid the inconvenience or unpleasantness of moving. While permanent settlement, itself, has advantages, villages of this type seldom receive the additional benefits of services. Schools and dispensaries require considerable quantities of water, and are found only in villages with ample supplies throughout the year.

4) FULLY-SETTLED VILLAGES.

The advantages of living in a village with permanent water are, however, counterbalanced by certain disadvantages. These settlements are nearly always in areas of dense population. Fuel may be expensive, land may be over-cultivated and new fields obtainable only several miles away from the village. It may be difficult to find grazing locally and there may be little

chance of being allocated hashab.

Moreover both people who are fully-settled and those who make local movements to obtain water may have difficulty in adapting their ways of life to meet exceptional water shortages. Where villagers make local movements for water and the water-point they are using fails, there may be no other source of water within reach. In a fully-settled village, people without animals may be unable to fetch water from the nearest water-point if their home supplies dry up. This is particularly true of villages in the Plains, where the village may be permanent because its population is small rather than because water supplies are especially good. They are often new settlements of pioneers who have not yet acquired beasts. Sited on the clays they are likely to find their nearest neighbours a considerable distance away.

WAYS OF LIFE ACCORDING TO TRIBE.

The different tribes of the area show marked preferences for different ways of life. Figure 123 shows the percentages of the main groups practising the various ways of life. As one might expect, the Arabs, who have a long history of nomadism, are the most mobile group. The nomads who enter Gedaref seasonally are all Arabs, and over 41 per cent of all transhumant villages in the area are Arab. For Arab villages

with large numbers of animals, transhumance is the traditional and best way of getting full use out of their beasts and grazing areas. Nearly a third of all Arab villages obtain their dry season water-supplies from nearby water-points. Because they have transport animals or money to pay for delivered water, Arabs can afford to stay in a village which lacks dry season water supplies. Since few want to engage in more than casual dry season pursuits it does not matter if their days are spent in fetching water from afar. Their chief assets, hashab and herds, can, if necessary, be cared for by others.

FIGURE 123:

WAYS OF LIFE PRACTISED BY THE VARIOUS GROUPS.

Ways of Life.	Percentage of villages belonging to each group practising these ways of life:-		
	Arabs.	Western Sudanese.	West Africans.
Fully settled	54	71	70
Making local movements to obtain water in the dry season.	29	22	18
Transhumant.	17	7	12

Western Sudanese prefer not to be transhumant except for a few who purposefully seek dry season employment elsewhere. But the majority do not want more than casual jobs. They are

prepared to spend their time fetching water, and a fifth of all Western Sudanese villages obtain their dry season water supplies from neighbouring settlements. The newer immigrants have few dependents so that large quantities of water are not required, and older settlers have for the most part acquired donkeys or camels.

Almost all the West Africans, with the exception of a few cattle-owning Fulani, come from a settled agricultural background. They are not accustomed to transhumance as practised by the Arabs, but, with a tradition of dry season trade and craftsmanship and a desire to make money for the pilgrimage, many are prepared to leave their villages in the dry season in order to obtain regular employment and markets elsewhere. What they are not prepared to do is to waste the dry season fetching water. Thus West African villages constitute less than 20 per cent of all villages using neighbouring water-points. In any case West Africans frequently have neither the animals nor the money to obtain water from far off. Ideally, however, West Africans prefer an environment like the Rahad where not only are water supplies adequate but there are sources of dry season profit as well.

Thus the ways of life preferred by the various tribes help to influence their distribution throughout the area. Figures 39 and 40 show how West Africans dominate along the R.Rahad, while the highest concentrations of Arabs are found in the dry

North Ridge and Nahl Hills. Western Sudanese predominate in the Plains, an environment of uncertain water supplies.

DISTRIBUTION OF WAYS OF LIFE BY AREA.

Figure 124 gives the percentage of villages in each area which practise the various ways of life.

FIGURE 124:

WAYS OF LIFE PRACTISED IN THE VARIOUS SETTLEMENT AREAS.

Ways of life.	Percentage of villages practising these ways of life in:-			
	The Ridge.	Nahl Hills.	R.Rahad.	Plains.
Fully settled.	65	51	100	52
Making local movements to obtain water in the dry season.	31	20	0	42
Transhumant.	4	29	0	6

80 per cent of the traditional transhumant villages are found in the Hills. Here, mainly as a result of the temporary nature of granite wells, nearly a third of the villages practise this way of life. Although villages using local water-points are found throughout the whole area, they are most typical of the Ridge, where 70 per cent of these villages are to be found. The wells on the crest of the ridge have ample water to support people from outlying villages on the edge of the clays. In the M.C.P.S.

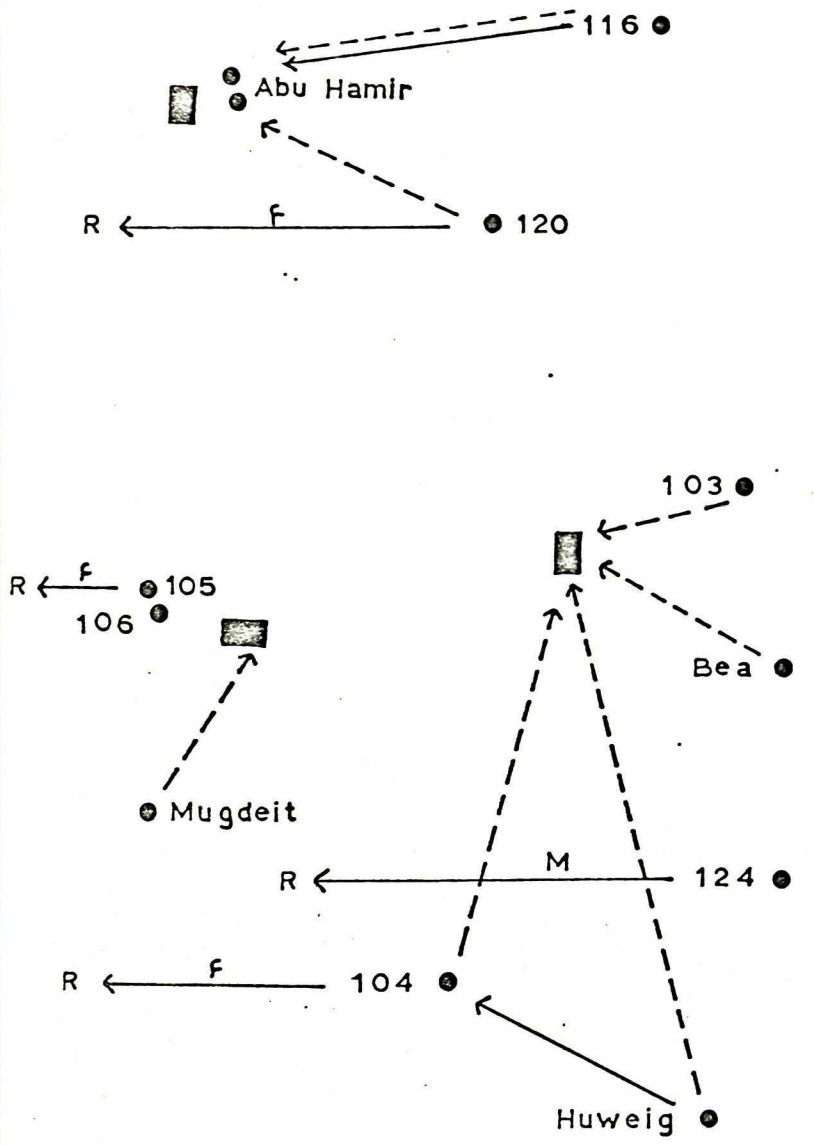
the high proportion of villages which seasonally resort to using neighbouring water-points illustrates the uncertainty of modern hafirs and deep bores as permanent sources of water. Apart from the Rahad, the highest percentage of fully settled villages is found in the southern part of the Ridge. This demonstrates the superiority of basalt wells as sources of village water supply.

CHANGES IN WAYS OF LIFE.

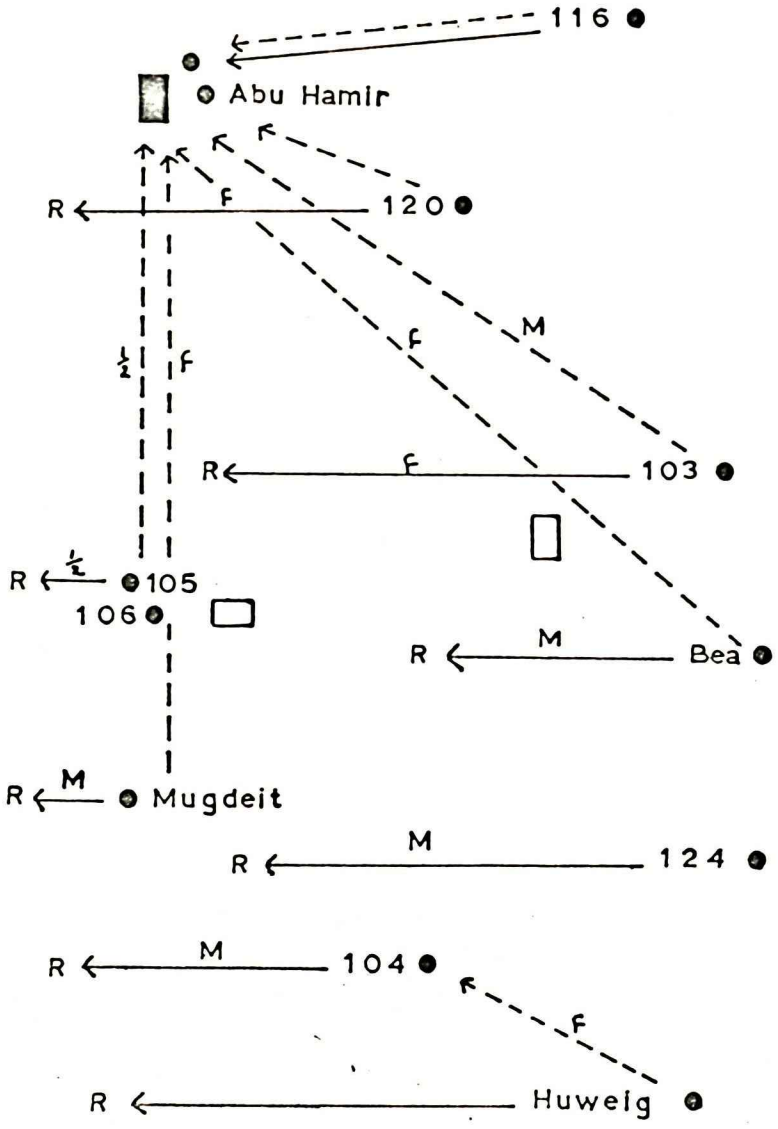
The ways of life described were originally devised in response to various degrees of water shortage. When changes in water supply occur, new methods have to be adopted to cope with the situation. Changes in the availability of water can be gradual or sudden. The sudden changes are either permanent, such as the construction or destruction of a water-point, or temporary, perhaps the result of an exceptional dry season.

In Gedaref the 1960 rains were universally poor. Ways of life throughout the area had to be modified considerably to cope with unexpected water shortage. Figure 125 provides an excellent example. It shows what happened in the central part of the Nahl Hills. Mechanized hafirs at Bea and Ban failed to fill. Everywhere hand-dug hafirs dried a fortnight and granite wells a month earlier than usual. As a result, for the first time half the new village of Huweig, joined fellow Western Sudanese from Kabaros and Shangiya in a migration to the river. Mugdeit, Bea,

FIG. 125. THE HILLS. DRY SEASON WATER POINTS.



NORMAL YEARS



1961

Key

- Movement to fetch water
- Migration
- R To R.Rahad
- F Few
- M Many
- Hafirs

For names of numbered villages see Appendix G.

Scale 0 — 2 mls.

N

the poor from Ban and Buweida resumed their transhumance, which had been abandoned with the establishment of mechanized hafirs at least eight years previously. (Qurein in the same situation found it impractical to return to all its dry season camps and hastily formed several new ones).

The remaining people at Huweig drank the appallingly salty water at Balos' well. Those left at Ban and Buweida spent their days fetching water from Abu Hamir, or paid for it to be brought. These villages who normally drank at home throughout the year, were forced to fetch water from more than five miles away for longer than five months. A few of them, particularly the weak, moved to Abu Hamir and squatted in vacant huts until the rains. Others, living in villages where water was scarce, remembered that they had relatives in better-watered areas and left to visit them. The schools at Ban were closed early because of the water shortage.

A year such as this serves to emphasize the dependence of the area on annual rainfall. It also underlines the need for a flexibility of outlook to enable emergency measures to be taken to meet unforseen water shortages, even to the extent of adopting a completely different way of life. The general availability of transport animals and the frequent lack of demanding dry season occupations make it fairly easy for people

from the older, fully-settled villages, to start fetching water from neighbouring water-points. These factors, together with the simplicity of building materials, and the absence of land ownership or of exclusive grazing rights, mean that a seasonal migration can be made with little prior planning.

When the water supply changes in a more permanent way, however, there may be a time lag in modifying ways of life to suit the new circumstances.

When water supplies improve, a transhumant movement may occasionally be continued for economic, traditional or social reasons. Certain West Africans go to Gezira to pick cotton for purely economic reasons. Improvements to their village water supplies might not affect the migration. After Ban's mechanized hafir was built, some of the people of Balos continued to accompany the cattle to the river. Most are West Africans. who make a profit from selling dried fish. There are also more Arabs than are strictly necessary to care for the stock. These people still migrate because they are accustomed to do so, and because they like being with their animals. Although water supplies at certain M.C.P.S. villages are now known to last all year, some families have remained transhumant. They consider that the services and social contacts available in their old homes in the Ridge are worth retaining. When a new water-point is founded, the early settlement around it is often

merely a rainy season camp for men from different places. Only several years later, if water supplies prove adequate, will the settlers establish their families and develop loyalties to their new village.

Generally, however, the human response to an improvement in the water situation is very swift. Thus the Arabs of the Hills dropped human transhumance just as soon as the mechanized hafirs were built. Where new water-points were being established in the Plains, the first settlers used to appear at the site as soon as construction began. But since a considerable number of hafirs and deep bores have turned out to be useless, people have now become more cautious.

The response to a deterioration in a water-point is normally much more sluggish. This is partly because the villagers may not at first realize that the deterioration is permanent. The growing incapacity of a well to water an increased village population may not be remarked until a year of poor rains accentuates the problem. Even then, the shortage may be ascribed purely to the low rainfall that year. Alternatively, attempts to restore an inadequate water-point may be made by cleaning it out and this may alleviate the situation for a few more years. Once settled in a village and accustomed to its routine, people are naturally reluctant to go elsewhere for their water. Permanent settlement carries a certain status

which villagers wish to retain. People, like those at Hassan, may spend large sums on buying water or go on interminable visits to relatives, rather than become properly transhumant. By the standards of common sense, Hagokat should have become a rainy season agricultural camp but many of its inhabitants are determined to remain settled. Arabs, in particular, are reluctant to abandon their traditional homes. During the last two years the water supplies at Suki in Butana have gradually failed. Despite this, the Shubriya sheikh of the village refuses to migrate in the dry season. He stays, although for several months each year his water has to be fetched by camel from over thirty miles away. Once established in a village, West Africans are reluctant to move except to complete the pilgrimage. (Thus they tend to choose villages where they will not be embarassed by inadequate water). The Western Sudanese are the most mobile group. Forever flitting, they seem to be heedless of where they live. Yet, when hafir Um Bileil failed to supply water in the dry season after three years of growing inadequacy, it was a further two years before the first group of Western Sudanese emigrated.

CHANGES IN SETTLEMENT PATTERNS.

Within Gedaref there is thus a continual rise and fall of settlements. New water-points enable new villages to be

established. The most obvious recent example of this has been the spread of settlements out into the Plains after the construction of deep bores and mechanically-excavated hafirs. During the post-Mahdia period, however, at least eleven villages have been abandoned. In every case the reason for leaving the village was lack of water. In several cases wells are said to have failed suddenly and mysteriously. But in many instances, it seems that the gradual increase in population, simply made the available water inadequate. Whereas in the Nahl Hills this increase in population caused a resumption of transhumance in the 1920s, elsewhere it resulted in emigration. Several years of poor rains usually aggravated the situation and precipitated the final abandoning of settlement sites.

These villages were established in areas of very marginal water supplies. Four were in the granite parts of the Nahl Hills, the rest on the outward edges of the Ridge. Several of these latter villages were sited far out in the Plains in areas now occupied by the M.C.P.S. They existed on water from low yielding Nubian sandstone wells and hand-dug hafirs. Some of the settlements nearest to the Ridge and in the Hills have been established in the last ten years. Usually water supplies are no better, but the desire of immigrants for new land has

prevailed over the fading memories of why the previous villages had failed. Most of these new villages are eking out a precarious existence with the help of water from neighbouring villages, often from new hafirs or deep bores.

When bores and mechanized hafirs were established in the Plains, people ignored the fact that there had been water-points in the area before. Settlers using the new water supplies were acclaimed as pioneers in a virgin environment. Yet, within the last eighty years, there had been transhumant and, probably, settled villages in parts of the clay plain. Mechanized hafirs have merely made it possible to penetrate further and more effectively into the clays. Indeed, after the first successful years of small villages and brand-new water-points, the inadequacy of many hafirs and bores has re-emphasized the marginal nature of the Plains as a settlement area. Today, however, a more permanent way of life should be possible in the clays provided that man's technical abilities are combined with constant vigilance. The use of machinery to maintain water-points is very effective and in time of extraordinary need trucks can bring water.

Thus settlements are still liable to ebb and flow around the edges of the three traditionally populated areas, and the general pattern to change correspondingly. A few years of poor rains, growing population and decreasing water supplies result

in a contraction of the settlement area. The number of villages in marginal areas is reduced. Several years of heavy rain, or a sustained demand for new land cause the populated area to expand. Settlements once more spring up in areas of precarious water supply.

HISTORICAL SUMMARY.

This emphasis on the ebb and flow of settlement at the margin is not intended to detract from the importance of new methods of obtaining water in the development of the area. New techniques of exploiting the potential water resources have, in fact, extended the margin, by making further areas available for settlement. Thus methods of excavating hafirs by hand enabled some use to be made of the Plain, and well-digging techniques opened up the Ridge. Whether or not these new sources of water were fully exploited depended on the kind of water supplies demanded to meet the needs of existing ways of life. Nomads requiring only temporary water-points might be satisfied with a small hafir. Cultivators, on the other hand, would try to obtain water-supplies which would last at least until the end of harvest and preferably support permanent settlement. The maintenance of water-points, too, has depended on demand for water. In times of peace this has usually been sustained

adequately by pressure from growing human and animal populations.

PRESENT SITUATION.

This pressure of population on existing water resources is clearly seen at present. The number of new wells and hafirs started by both rural councils and villagers since 1957 shows that the need to improve water supplies is gaining recognition. A growing population is being enriched by immigration at a rate never previously seen in the area. At the same time the relative success of the M.C.P.S. has made both government and local farmers more constructively aware of the potential of the clay plains. Generally rising living standards bring a new demand for fully-settled villages with permanent water supplies, while at the same time increasing the amount of water considered necessary to maintain acceptable standards of health and hygiene.

Yet despite government concern, water supplies in Gedaref are becoming increasingly inadequate for modern life. In Gedaref Town seasonal water shortages and the absence of a piped water supply retard the expansion of the urban area. There is not enough water to allow the development of a brick industry, which would improve building standards. The high cost of having water delivered and the irregular nature of supplies hinder private investment in enterprises such as

hotels. Both here and in the larger villages the development of public services is held up by lack of water.

In the rural areas much of the plain still remains unexploited because of the absence of water-points. Most of the villages established on the edges of the settled areas have reached their maximum possible size in terms of water availability. Although new hafirs and bores have facilitated some spread of population and peasant agriculture in the last fifteen years, the numbers helped by this have been far fewer than the number of immigrants entering the area. Thus, the total effect has been for the overcrowded areas of traditional settlement to become even more congested.

At present only 65 per cent of the villages of the area are fully settled. And these are mostly in regions of dense population, where adequate amounts of fresh cultivable land are seldom available locally. In response to scarce water supplies people in over 35 per cent of the villages are forced to alter their way of life in the dry season, with a consequent loss of time and energy.

Moreover, as 1960 showed, over 98 per cent of the villages in the area are directly dependent on seasonal replenishment of their sources of water. For the 77 per cent of villages relying on rainfall to refill gallits, jamams, wells and hafirs

fluctuations in supply can be very violent. Modern technology can provide better methods of extracting and conserving water when the rains come but can do nothing if they fail. The flexibility of life required to adapt to these fluctuations has not diminished, but it is more difficult to attain as life within the areas becomes more complex.

In the past the need for mobility was usually accepted philosophically but this is unlikely in future. The acquisition of household property will make movement less easy. The secondary and tertiary sectors of the economy are expanding fast. A desire for the wealth to be gained from dry season employment will make more men reluctant to waste their time fetching water. Moreover, if trends in other countries are comparable, there will be an increased demand for a settled life per se as a symbol of progress, quite apart from the benefits it may bring. Yet, with the present growth of population by natural increase and immigration, water supply problems are likely to become more severe in the next few years. A greater degree of mobility and effort - rather than less - will be required to cope with the situation.

In the immediate future it seems likely that immigration into Gedaref will continue, and further attempts be made to

extend cultivation in the clay plains. To this end new water-points will doubtless be established. Pioneer settlements will probably extend out into the far south and east. In the southern areas of the Nahl Hills there are serpentine outcrops offering good chances of permanent supplies of well water. In the south of the Ridge in both basalt and Nubian sandstone areas there are water-points which used to support villages but which have not been reopened since the Mahdia. In the east where the clays lie thinly over the rolling countryside water is beginning to be obtained from wells in the hollows.

Generally, future developments will probably be in the south. Previously, the M.C.P.S. was established as far north as possible because the land was easily cleared, but the north now lacks sites for further water-points. Though the job of colonizing and cultivating the south is so much harder, it has more potential sources of water. There is also a greater likelihood that water when obtained will be adequate, because the rainfall is heavier and more reliable. More sites may be found for hafirs and deep bores but for both the most obvious places have already been exploited. Seen in the light of fifteen years' experience these are no longer thought to be the panacea for water supply problems. Future developments in hafirs are likely to be more expensive and restricted in scope as less suitable sites have to be developed.

Meanwhile, in Gedaref Town large scale projects such as pumping water from the Atbara or building huge shallow reservoirs are contemplated. In the area as a whole, however, the most important aspect of water supply in the next few years will not be the establishment of new sources of water but the maintenance of existing ones. The period 1950-60 saw the development of many new water-points. Over 27 per cent of the existing wells in the area and over sixty hafirs were built in this decade. But although they clamour for more water-points neither people, councils nor central government departments regularly undertake the less glamorous task of maintaining existing ones. Without this persistent drudgery, however, the water supply situation will gradually and undramatically deteriorate. The useful life of new water-points, particularly hafirs, will be reduced to a few years. Despite modern technology the clay plains remain a marginal environment requiring constant care, watchfulness and adaptability if they are to be exploited.

CONCLUSION.

In the Central Clay Plains water has always been the critical factor controlling the amount and the location of settlement; it still is. The adequacy, the reliability and the seasonal nature of the water supplies exert a considerable influence on the way of life of the local people. Within the limits imposed by the availability of water, however, the detailed siting of settlements is the result of political, tribal or individual considerations. In the same way, modes of life, while limited in scope by the shortage of water, vary according to the traditions of the peoples concerned, and in response to economic stimuli.

Within the area studied there are four distinct water environments. There are the seasonal river Rahad, the granite and serpentine hills of Nahl, the basalt ridge of Gedaref, and the occasional hafirs of the plain. Settlement is confined to these four environments by broad expanses of waterless clays. The distribution of population is consequently very uneven. Widely separated as they are, four distinct types of settlement are found in these environments. Nucleated villages cluster tightly at the foot of hills where well water is available, are strung out along the river, or form small irregular settlements in the isolation of the plain.

Different tribes entering Gedaref at various times have

found different parts of it more suited to particular ways of life. Western Sudanese immigrants mixed with Arabs in the traditional hill areas or, later, risked life in the plains, while West Africans were attracted to the river. Thus the different water environments were settled by different kinds of people. This, together with the fact that water supplies in the four areas are of very varying adequacy, has resulted in rather different ways of life predominating in the four environments.

Yet despite these variations in human patterns, the area retains an essential unity. The very clay plain which diversifies settlement forms the most widespread physical feature of the area, and gives it it's distinct character. The uniform fertility of the soil, combined with a rainfall which is almost always adequate for cultivation, makes the area well suited to dura and simsim production. Whatever their original occupations or secondary pursuits, all the tribes have adapted themselves to their environment to the extent that this type of agriculture is their primary source of income. Because of the availability of land, everyone can farm in his own right. None need be subservient, so that tribal and racial tensions are at a minimum.

Tribal ways of life are also modified in response to the seasonal and irregular nature of water supplies. Throughout the

area ways of life have to be sufficiently flexible to cope, not only with seasonal water shortages,but with wide fluctuations in supply. Where three-quarters of the villages are dependent on annual rainfall for the replenishment of their water supplies, modern technology cannot greatly improve the situation. Mechanization has made it possible to grow traditional crops on an additional 25 per cent of the area studied, but new techniques of obtaining water have done little to facilitate the extension of settlement into the clay plains. Over 90 per cent of the villages and about 95 per cent of the population live in the three areas of traditional settlement. Because of steady immigration and natural increase, the pressure of population on existing water-points is growing. Settlement is being extended outwards into marginal areas of uncertain water supplies. In these circumstances, water-points are becoming increasingly inadequate, and seasonal and irregular fluctuations in supply more critical. Greater mobility and flexibility are required to deal with the situation at a time when social and economic pressures tend towards a more settled way of life.

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APPENDIX A.

FIELD METHODS AND AVAILABILITY OF DATA.

Field work was carried out between February 1961 and January 1962, when I was attached to the University of Khartoum as a holder of a Goldsmith's Africa Studentship. While in Sudan, I was a member of the University of Khartoum Arid Zone Research Unit.

After reconnaissance in southern Kordofan and Kassala provinces, where I toured with members of the Department of Land Use and Rural Water Development, I selected part of Gedaref District for further study. The area is important because of its agricultural potential, and because it is one of the fastest developing parts of Sudan. It contains within it a remarkable variety of water-points and settlement types.

From a practical point of view, settlement is sufficiently dense to make travelling between villages on foot possible. For the last four months, however, I used a Land Rover belonging to the Arid Zone Research Unit.

The area was seen at all seasons of the year except during the height of the rains, when a term was spent at the University of Khartoum, collecting bibliographic material and data from government offices. Each of the settlement areas was

seen twice, once between April and July, and once between October and January. A total of twenty-two weeks was spent in the field.

GENERAL METHOD OF STUDYING VILLAGES.

On entering a new settlement area I spent some days finding a typical, and preferably centrally placed, village for detailed study. I then lived in this village, paying daily visits to the surrounding settlements, which were studied in less detail. Where a group of villages had characteristics very different from those of the village where I was living, one of these would be selected for somewhat more detailed study.

In each of the villages where I lived a family "adopted" me. This was completely spontaneous. Not only was I thus given a position in the village, but I had a "father", who regarded himself as responsible for me, and a home in which to chat and have occasional meals.

THE COLLECTION OF DETAILED STATISTICAL DATA ON INDIVIDUAL VILLAGES.

The purpose of collecting detailed statistics was to obtain more accurate and quantative information about water use and ways of life for certain selected villages. When discussing the affairs of a village, a sheikh or other responsible

person would frequently make remarks such as "Oh, we have a terrible time in the dry season. Nearly everyone has to go away as there isn't any water". Such a remark is vague, and probably exaggerated. Only by interviewing everyone in the village, could one find out what proportion actually left in the dry season, and whether their motives for moving were mixed.

Before such individual interviews take place it is essential that there should be adequate preparation. Usually I had lived for some time in the village concerned, or at the very least, I had already met the majority of villagers. Unless one is well acquainted with the village, one cannot know the most important questions to ask. Since people are restive if they are asked too many questions, it is important that the few that are asked - usually about ten - should be the ones that are most relevent. Because of this, the questions asked were not the same at all the villages, since what was important for one might be relatively unimportant for another.

Before villagers were questioned, the sheikh was approached. Only if he seemed perfectly happy and thought that the villages would co-operate did interviewing take place. All interviews were conducted in the presence of the sheikh; he would have been insulted had it not been so and his presence was regarded as both appropriate and proper by the villagers. The normal

method was to ask the villagers to assemble at a certain time, to question them as they arrived, and to allow them to go as soon as they had been questioned (the idle and the curious usually remained). It was found that early morning and late evening were the most suitable times for seeing people.

Obviously some villagers never came to be interviewed at all. At any one time some would be away from the village, either for the day or for a longer period. When, after cross-checking it was proved that brothers were able to report accurately on each other's households, a brother was allowed to record for an absentee. Since there seemed no special bias on the part of those who stayed away, a sample of over 80 per cent of the adult male villagers was considered adequate. There seemed to be little point in prejudicing good-will by demanding to see someone, who for some reason or other, had not put in an appearance.

In fact, except in small villages, no one knew exactly how many adult male householders there were. The problem of defining an "adult male householder" was left to the sheikh and the villagers. All those who thought themselves grown men came. Normally an adult male householder had a wife, children and possibly older folk dependent on him and was farming in his own right. A few of the younger ones were still unmarried. The older ones often lacked dependents as their families had

grown up. Occasionally they were so frail as to be dependents themselves. But for the Hausa, who were apt to include mere youths, the concept of what constituted an adult householder was at least consistent.

It is extremely hard to decide to what extent villagers gave true and accurate answers to questions. Considerable cross-checking was carried out and it was found that there was a remarkable accuracy in answering. Occasionally the implication of a question might be imperfectly understood, and only a partial answer given, but after a few cases like this the interviewer was usually able to notice and to remedy the situation. The fact that interviews were carried on in the presence of the sheikh and often of other villagers does not seem to have made the results any the less accurate. There is little point in bragging or exaggerating to impress in a small community where the listeners know your true situation. Indeed, other villagers were most useful in helping the very old or very stupid to answer correctly. It must be admitted, however, that the questions asked were designed not to upset people, and certain touchy subjects were never mentioned. Torn between a desire to display his wealth in beasts and his fear of taxation, it would be unfair to ask a man how many cows he had or to expect a truthful answer. The official animal returns are

estimated to account for only a third of the actual number of beasts.

When Mrs Culwick was working on a social survey in Gezira[1], she too found the Arabs generally helpful and accurate in their information. She was, however, unable to question any West Africans who regarded her with suspicion. Perhaps because I knew Nigeria and spoke some Hausa, I was luckier. Non-Sudanese, having doubtless decided I was not connected with the government, were generally as responsive as Arabs and Western Sudanese.

Arabic and, occasionally, Hausa was used for all interviews. Arabic was essential. I found only two villagers who spoke any English. About six had some French and a dozen Italian. Since so many people in the area speak Arabic as a second language, my strange accent did not constitute a social barrier.

DATA ABOUT WATER POINTS.

An estimate of the capacities of hand-dug hafirs was made by pacing. The Department of Land Use and Rural Water Development has figures for the capacities of mechanized hafirs when they were constructed. The total depth of wells, and the depth of water in them, was measured. Local people were asked to give

[1]Culwick, 1951: p.32.

estimates of where the water-level was at different times of the year.[2]

Much of the information about the adequacy of water supplies had to be obtained from the local people. Initially they were inclined to exaggerate the shortage they suffered in the dry season, because they hoped I would ask the government to improve the situation. Others with good water exaggerated their advantages, claiming that everyone from miles around always drank here. Requests for names of villages and dates, however, usually resulted in more prosaic and accurate information.

QUESTIONS ASKED WHERE RELEVANT.

A) Questions asked at all villages.

1) How old is this village?
2) What tribes are found in the village?
3) When did the different tribes arrive at the village?
4) Where do you get water for drinking?
5) Where are your goats/cattle watered?
6) During which months do you and your animals get water from the various water-points which you use?

[2]A sample of wells from each rock type were measured in greater detail for physiographic purposes. The results provide information about the percolation of sub-surface waters, but have little bearing on the total amount of water eventually available for use. They are therefore omitted.

7) How old are the water-points which you and your animals use?

8) Where did you and your animals get water before your present water-points were made?

9) Do people in the village have gum gardens? How many? Where are they?

10) Do people in the village have gerf? How many?

11) Where are the villagers' fields?

12) What do most villagers do in the dry season?

B) Questions asked at all water-points.

1) Who built this water-point?

2) How old is it?

3) Who maintains it? How often? When was it last maintained?

4) During how many months does it provide water?

5) From what villages do people, goats and cattle come to drink here?

6) During which months do each group of people or beasts come?

7) About how many people or animals are there in each group?

8) For about how many years have each of the groups been coming here?

9) Do any extra groups come to get water here in years of unusually poor rains?

10) Do any nomads come here? How many people and animals come? How long do they water here? For about how many years have they been coming here?

11) Is a charge made for watering cattle/goats here? How much?

C) Questions asked of all villagers in selected villages.

1) What is your tribe?

2) Where were you born?

3) How many years is it since you left home?

4) At what places did you stay after leaving home?

5) How many years did you stay at each of them?

6) Have you been to Mecca?

7) How many years have you been in this village?

8) How many adults and children are there in your household here?

9) Have you any goats/cattle/donkeys/camels?

10) What do you do in the dry season?

11) Have you gum arabic?

12) Have you gerf?

13) Do you use a tractor for cultivation? For how many hours?

14) How many labourers do you employ (a) on your farm, (b) on your gum garden?

15) How much water does your household use daily (a) in the rains, (b) in the dry season?

16) Do your goats drink in the house or at a water-point?

17) Where does your drinking water come from (a) in the rains? (b) in the dry season?

18) Who fetches it (a) in the rains? (b) in the dry season?

19) How many journeys are made daily to fetch water (a) in the rains? (b) in the dry season?

20) How much water is carried at a time? Do you use a donkey or a camel (a) in the rains? (b) in the dry season?

21) Do you ever buy water? During which months? How much do you pay for it? Does the price vary at different seasons? By how much?

The general questions asked at villages and water-points (Sections A and B) were usually brought up in the course of conversations. The answers were recorded later. When villagers were interviewed (Section C) a questionaire form was used. Altogether detailed surveys were made of villagers in twenty communities in sixteen villages.

AVAILABILITY OF OTHER DATA.

1) Published Maps.

The whole Sudan is covered by maps on a scale of 1:250,000.

A new map series on a scale of 1:100,000 is being prepared from air photos and is designed to cover the Central Rainlands. As yet there is no coverage for Gedaref District. The 1:250,000 map, which covered most of the area studied, was published in 1937. Over 40 per cent of the present villages are not shown on it. Others are wrongly located. It has some spot heights and rudimentary form lines.

2) Air Photographs.

The whole Sudan is covered by trimetrogon air photos taken by the United States Air Force at the end of the war. They are, therefore, rather out of date. They were taken from too great a height to provide much useful information for detailed studies of the kind undertaken. Those covering the west of the area studied have been lost. Many of those still available are spoilt by cloud.

In the early nineteen-fifties the Sudan Survey Department reflew the Qala'en Nahl Hills area but there are bad gaps between runs. Later individual photos of certain hafirs were taken for the Department of Land Use and Rural Water Development. In 1962 the northern part of the Mechanical Crop Production Scheme was photographed. I was present, and extra photos were taken of selected villages in the country south of the M.C.P.S., at my request.

3) Government Files.

The following government offices gave me free access to their files[3] :-

Department of Land Use and Rural Water Development.

Sudan Survey Department.

Ministry of Agriculture.

Kassala Province Administrative Headquarters.

Kassala Province Land Use and Rural Water Development.

Gedaref District Administrative Headquarters.

Qala' en Nahl Rural Council.

Gedaref North Rural Council.

Gedaref South Rural Council.

Gedaref Town Council.

The following government offices provided technical data:-

Geological Survey (water analyses of water from deep bores).

Gedaref Public Health Department (water analyses of water from wells).

The Wellcome Laboratories (analyzed the extra water samples I collected).

The Wad Medani Research Station (soil samples)[4]

[3]The names or numbers of files are not given as the filing system prevelant in government offices does not warrant it.

[4]Soil samples were collected for agricultural purposes only. Thus

I am grateful for the help of all those mentioned in this appendix, and in particular for the kindness of the people among whom I was working.

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only mechanical analyses, total salt content and Ph values are available. I collected samples for detailed cheemical analysis, to obtain information about the rocks from which the clays are derived, but owing to climatic difficulties in Sudan, the results will not be available until the end of 1963.

APPENDIX B.

TREES AND SHRUBS COMMONLY FOUND IN THE AREA STUDIED.

Habil	Combretum ?
hashab	Acacia senegal Willd. (Gum arabic).
higlig	Balanites aegyptiaca Hochst.
kitr	Acacia mellifera Benth.
Laot	Acacia orfora Forsk.
Luban	Commiphora quadricincta Sweinf.
sidr	Ziziphus spinachristi Willd.
sofar	Acacia drepanolabium Harms.
sunt	Acacia arabica Willd. (Mimosa).
talh ahmar	Acacia seyal Del.
talh abyad	Acacia fistula. Sweinf.
tebeldi	Adansonea digitata Linn. (Baobab).
ushur	Calotropis procera Art. (Dead Sea apple).

Compiled from Tothill[1] and Broun and Massey[2].

Note. There is still doubt about the classification of the acacias, but the above names are those which are most commonly used.

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1. Tothill 1948.
2. Broun and Massey 1912.

APPENDIX C.

THE AVAILABILITY AND RELIABILITY OF METEROLOGICAL DATA IN GEDAREF DISTRICT.

In Sudan, climatic data is collected by the Sudan Meterological Department. Compared with the rest of Sudan there are many stations recording rainfall in Gedaref District. Most have been started in connection with the Mechanical Crop Production Schemes (M.C.P.S.).

Two stations, Gedaref and Mafaza, have been operating continuously since 1910. Nine more stations have records which begin before 1950, and have only one or two gaps in the last eleven years. A further thirteen stations operated for a year or more between 1945 and 1951. The most complete records for this period are for 1950 and 1951 when eleven stations sent in complete rainfall data. These thirteen stations, however, were all in areas of the M.C.P.S. All but two were close together in the northern part of the scheme. After 1951 most of these stations were given up. In 1959 about eleven new stations were established in large villages. They were well distributed throughout the District. Since that time, however, none of these have sent in complete records for more than one year.

Many of the people collecting rainfall data are watchmen of Hafirs. As these are often illiterate it is difficult for them to keep accurate records. In the rainy season postal

services are almost non-existent and figures for a whole month may be lost in the mail.

Originally, it was hoped to construct an isopleth map of the area using data from the eleven stations which had been in operation for the last eleven years or longer. Five stations, however, had gaps of one or two years. Since the comparison of rainfall data of different periods may lead to false inferences, it was necessary to try to interpolate for the missing observations.

An attempt was made to do this using the method of ratios. This method assumes that if there are two stations a and b which are close together, the differences between their rainfalls will be a constant or near constant ratio.

$$\frac{p\ (a\ n)}{p\ (S\ n)} \quad q \quad \frac{p\ (a\ N)}{p\ (s\ N)}$$

where N normal period of operation of station S

n short " " " " " a ($n < N$)

p (SN) normal average rainfall at S during period N

p (a n) average rainfall at A for short period n

p (a N) average rainfall at a reduced to the normal period.

The aim is to find p (a N)

To check the applicability of this method it was applied to two stations Qala en Nahl and Hawata. The rainfall data for both towns for the twelve years between

1944 and 1945 inclusive were complete. It was decided to estimate the rainfall for Hawata in 1948.

let S Qala'en Nahl

let a Hawata

let N the twelve year period

let n an eleven year period

p (a n) 670.9 mms.

p (S n) 710.8 mms.

p (SN) 612.6 mms.

$$\frac{670.9}{710.8} \quad \frac{(p\ (a\ n)}{612.6} \text{ mms}$$

578.3 mms.

Thus the estimated rainfall for Hawata in 1948 was 578.3 mms. The actual rainfall, however, was 312.4 mms. The method showed a 54% error. Similar margins of error were obtained when this method was applied to other text examples.

Because of this large margin of error, the ratio method of interpolating missing records was abandoned. Periods of different lengths were used in the construction of the mean rainfall map.

An eleven year period is rather too short for the construction of rainfall means, so that too much dependence

should not be placed on the actual value of figures on the map. This is made clear if we consider means of different lengths. These are available for the two long-term stations of Gedaref and Mafaza.

	Eleven Year Mean 1950-1961	Sudan Standard Period 1921-1950	Fifty Year Mean 1916-1960
Gedaref	560 mms.	680 mms.	638 mms.
Mafaza	551 mms.	638 mms.	589 mms.

APPENDIX D

ARCHEOLOGICAL SITES IN THE AREA STUDIED

PLACE	CO-ORDINATES North	CO-ORDINATES East	EVIDENCE
RIVER RAHAD			
Dani Kola	13^{26}	34^{37}	Fung "stones" - possibly red bricks. Old occupation site. About two mls. north of Hawata by the river. (Hearsay).
HILLS OF QALA' EN NAHL.			
Qala' en Nahl	13^{37}	34^{56}	Rock pictures by gallit in serpentine. Mainly spotted giraffe and elephant. No camels. (Addison 1931).
Qurein	13^{32}	34^{47}	Rock pictures on granite hill. Spears, elephants and horse. (Kirwan's Survey 193 ? Graham 1962).
J.Simsim	13^{13}	35^{13}	Rock pictures on serpentine hill. Palms and elephants. Game. Graves. (Reported by Attia Mohamed Saeed 1962).
Um Sagata	13^{19}	35^{01}	? Small hill west of J.Um Sagata. (Ruxton 1959).
J.Sanga'at	13^{39}	35^{24}	? (Reported by Attia Mohamed Saeed 1962).
Red Rock	13^{40}	35^{29}	? (Reported by Attia Mohamed Saeed 1962).

PLACE	CO-ORDINATES North	East	EVIDENCE.
J.Beila	13^{40}	34^{50}	Occupation site on granite hill top. Hut walls, graves, terracing, sherds, quems, stone tool. (Raikes 1957, Graham 1962).
J.Balos	13^{23}	34^{57}	Occupation site on granite hill top. Sherds, quems, thin bricks(?) iron ring, stone tools (?) (Raikes 1957)
J.Ban	13^{25}	34^{55}	Occupation site on granite hill top. Hut walls, terracing, quems, sherds, polished stone tools. Agricultural terracing. (Graham 1962. Berry 1960).
J.Kambaros	13^{31}	34^{49}	Occupation site on granite hill top. Hut walls, terracing, hearth-stones, sherds, quems, polished stone tools. (Graham 1962).
J.Qelbi	13^{37}	34^{44}	Occupation site on granite hill top. Hut walls (?) sherds, game, washbowls, knappflocher. (Graham 1962).
J.Heleiba	13^{36}	34^{41}	Occupation site (?) on granite hill top. Sherds. (Graham 1962).
J.Mugdeit	13^{24}	34^{55}	Occupation site on granite hill top. Hut walls, sherds. (Graham 1962).
J.Bea	13^{26}	35^{00}	Occupation site (?) on granite hill top. Hut walls, quems, sherds. (Reported by Sherif of Bea 1962).

PLACE	CO-ORDINATES North	East	EVIDENCE.
Abu Ranga	13^{36}	34^{56}	Occupation site (??) on serpentine hill. Sherds. North of Abu Ranga on the Qala en Nahl road. (Graham 1962).
El Gir	13^{38}	35^{00}	Serpentine hill. Games, sherds and thick pottery on hill foot near gallit. (Graham 1962).
CLAY PLAIN.			
Sheredat	13^{56}	35^{14}	Neolithic sherd. (Irwin 195 ?)

APPENDIX E.

ACCOUNTS OF EUROPEAN TRAVELLERS WHO WROTE ABOUT THE AREA STUDIED.

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London.

WERNE, F.
1852.

African Wanderings, or An Exhibition from Sennar to Taka, Basa and Beni Amir.

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Beurman.	1860 - 61.
Didier.	1854.
Hamilton.	1854.
Junker.	1876.
Maggard.	1876.
Malzac.	1855.
Schweinfurt.	1865.
Stewart.	1883.
Vassiere.	1855.
Werne (J.).	1850 (?)

APPENDIX F.

MAIN TRIBES FOUND IN THE AREA STUDIED.

1. Arab tribes in Gedaref before the Mahdia.

Arakiin or Arakin.

Asamur (part of the Batahin).

Ashama (part of the Ga aliin)

Boidre.

Dubanya.

Ga'aliin or Jaalin.

Hammada (part of the Kahwahla).

Herawa.

Hesenat.

Kahwahla or Cuahla.

Kawasma (part of the Rufa'a).

Kenana.

Mesallamia or Misallamiya.

Rikabia or Ricabin.

Rufa'a.

Sherifa or Sharifa.

Shukriya.

2. Arab tribes, which entered Gedaref after the Mahdia.

(a) from Western Sudan

Bagirma.

(b) from further west.

Bagirma.

(a) from Western Sudan.

Beni Halba.

Bideriya.

Gawama a or Jawama

Gimr.

Gima'a.

Habbaniya.

Howasma.

Humr.

Lahawin.

Misseria.

Risaykat or Risegat.

Ta'aisha. or Taisha

(b) from further west.

Beni Halba.

Rashid.

Rowashda.

Salamat.

3. Non-arab tribes now found in Gedaref.
(most entered Gedaref after the Mahdia).

(a) From Western Sudan.

Berti.

Birked.

Dajo.

Fertit.

Fur.

Kunjara. (part of the Fur).

Masalit or Miselit.

Merarit.

(b) from further west.

Bilala.

Fulani.

Hausa.

Rashid.

Roma.

Rowashda.

Salamat.

Sungurawi.

(a) From Western Sudan.

Mimi.

Tama.

Tunjur.

(b) from further west.

(c) Other Sudanese tribes.

Besa (from the Ethiopian border country).

Dinka (from the south).

Fung (from Blue Nile).

Gumes (from the Ethiopian border country).

(d) Generic names for groups found in Gedaref.

(1) Beja (the "fuzzy-wuzzies" of the Red Sea area. Those in Gedaref are mainly Beni Amir and Hadendowa.).

(2) Borku or Bourgu (people from the west who settled in Darfur and Kordofan in the seventeenth and eighteenth centuries).

(3) Bornu or Burnu or Bournu (people from the old sultanate of Bornu. They include people from eastern Nigeria and western Chad. They are often Kanuri).

(4) Fellata (commonly used to mean any West Africans. Occasionally used only of Fulani who entered Darfur in the eighteenth and nineteenth centuries).

(5) Habash (Ethiopians).

(6) Nuba (people from the Nuba Mts., Kordofan).

(7) Senegal (Senegalese).

(8) Takruri (pilgrims from the west - probably Chad and Darfur - who settled near Gallabat in the seventeenth and eighteenth centuries).

(9) Tegali (Nigerian pilgrims who have settled in Tegali District, Kordofan).

Note on Source Material.

The spelling of tribal names is that used by MacMichael[1], but where a name is commonly spelt a different way the more usual spelling is also given. Maps showing the distribution are given by MacMichael and Murdock[2].

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1 Macmichael 1922.

2 Murdock 1959.

APPENDIX G.

VILLAGES IN THE AREA STUDIED.

(Numbers correspond to those on Fig. 126).

R. RAHAD.

1	Sherif	2	Malik
3	Malik Jadid	4	Bawat
5	Mafaza	6	Yusuf
7	El Queisir	8	Heimura
9	Um Suidiba	10	Abu Diggin
11	Ruwina	12	Hassan
13	Hashasha	14	Sarjam Burro
15	Sherrif Jaladin	16	Reagh
17	Shagga	18	Um Ushara
19	Takoza	20	Higliga
21	Koka	22	Dabaloba Cumur
23	Dabaloba	24	Dabunga
25	Sarkin Noma	26	Um Bakr
27	Gargosha Mulala	28	Suliman Gargosha
29	Arzuga	30	Jaladin
31	Burbor	32	Qasim
33	Sillah	34	Dani Kola
35	Malowlo	36	Bello
37	Hawata	38	Arzuga
39	Wad Es Shey	40	Cuna
41	Germain	42	Calipha

43 Senegal
44 Wad Munir
45 Elias
46 Shirma
47 Cotoco
48 Mekancana
49 Gezira Fatma
50 Ardeba
51 Medeika
52 Maid
53 Abd El Latif
54 Malawiya Jadid
55 Wad Bakr
56 Zedan
57 Wad Gaw̃zus
58 Shammam
59 Greigrib
60 Abu Ghazal
61 Amaria
62 Wad Arud
63 Elias

THE NAHL HILLS

101 Qurein
102 Bea
103 Buweida
104 Balos
105 Ban Calipha
106 Ban
107 Mø̃gdeit
108 Heleiba
109 Beila
110 Elǧir
111 Qelbi
112 Porters
113 Kartot
114 Arid
115 Wad Shush
116 Kambaros
117 Utash
118 Um Sagata
119 Huweig
120 El Agarr
121 Qala' En Nahl
122 Abu Ranga

123	Amara	124	Shangiya
125	Makarandun	126	Asama
127	Faraz	128	Marafa
129	Um Masan	130	Ban Jadid
131	Abu Hamir	132	Sagadi
133	Qongoleisa	134	El Kau
135	Halimab	136	Duheima
137	Matna	138	Gallaba
139	Matna Mahatta	140	Um Burush

THE RIDGE (NORTH RURAL COUNCIL).

201	Um Khanjar Donkey	202	Um Khanjar
203	Azaza Misellamiya	204	Karadis
205	Hagokat	206	Burnawi
207	Wad El Tom	208	Wad Shabut
209	Wad Kabu	210	Azaza Lahawin
211	Azaza Mahatta	212	Ruwashda
213	Malik	214	Rufa'Aa
215	Wad Esh Shagera	216	Tor For or Huria
217	Hisenat	218	Shemeliab
219	Abu Rogul	220	Hassan
221	Wad Es Said	222	Sharafa
223	Dallasa	224	Ghubeisha
225	Wad Omar	226	Ghubeisha Jadid
227	Um Senebra	228	Sofi

229	Hillat Al Sheik	230	Idd El Tin
231	Wad Widdaeda	232	Um Gulja
233	Wad Kibair	234	Um Sidera
235	Wad Domat	236	Um Higliga
237	Amara		

THE RIDGE (SOUTH RURAL COUNCIL).

301	Serraf	302	Kabaros
303	Kiru	304	Kandawa
305	Wad Daif	306	Abayo
307	Abu Arief	308	Gani Burra
309	Sufara	310	Gerrab Fur
311	Abu Nagga	312	El Qadir Harun
313	Talulus	314	Sannad
315	Assar	316	Cumur Assar
317	Kagera	318	Abu Hassan
319	Batoga	320	Genan
321	Kassab	322	Kom Shitta
323	Wad El Helengi	324	Kamadib
325	Ambasa Tebeldiya	326	Kunz
327	Tegali	328	Kara
329	Hemelia	330	Jaalin Hemelia
331	Ambasa Takaril	332	Rawashda

333	Saseib	334	Shasheina
335	Zureiga	336	Taqali
337	Tawarit	338	Rashid
339	Rashid Tani	340	Doka
341	Doka Jadid	342	Fellata Serraf
343	Serraf El Ahmar	344	Wad Arud
345	Serraf Said	346	Kafai
347	Abu Irwa	348	Wad Ganofa
349	Gerrib	350	Wad Esh Shagara
351	Sureifa	352	Sinun
353	Jebel Matna	354	Manasra
355	Rogila	356	Muderdama
357	Kanara	358	Dawlish
359	Humra	360	Sabun
361	Dowkey	362	Mahal
363	Tegali Mosa	364	Kanara Geneina
365	Grigana		

M.C.P.S.

401	Wad Widdaeda	402	Um Bileil
403	Kilo Sitta	404	Leiya
405	Abu Kashma	406	Ghadambaliya
407	Um Sheredat	408	Huri
409	Abu Ruwa	410	Domat

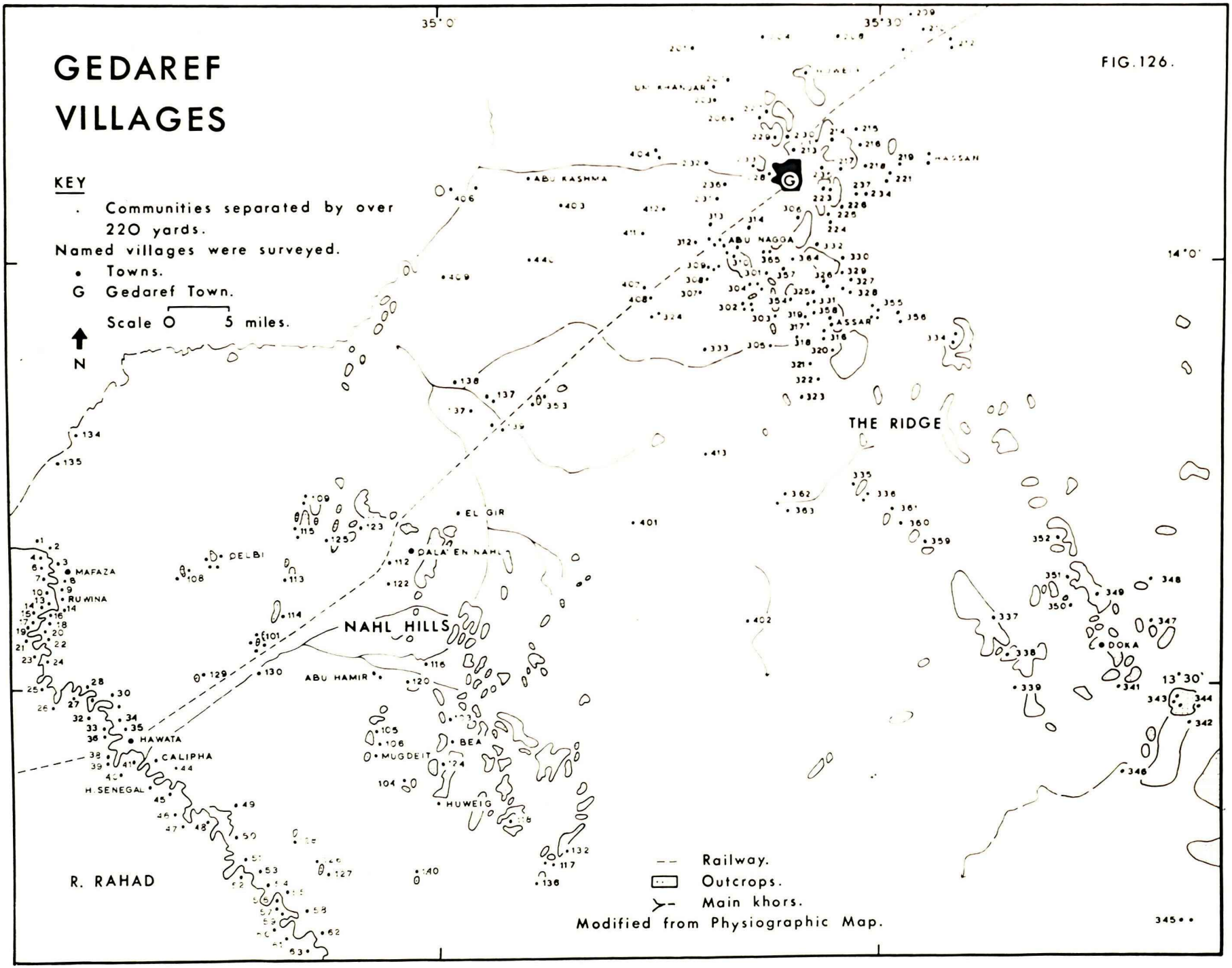
411 Trea Bir

412 Trea Donkey

413 Azaza

Note.

A single village name may be given to several physically separate communities, which may be up to a mile or so apart. Such a complex settlement is often very large. Thus, as already mentioned, communities more than a quarter of a mile apart are treated as separate villages for statistical purposes.


GEDAREF
VILLAGES
FIG.126.
KEY
. Communities separated by over 220 yards.
Named villages were surveyed.
• Towns.
G Gedaref Town.
Scale 0 5 miles.
N
35°0'
35°30'
14°0'
13°30'
ABU RASHMA
ABU NAGGA
HASSAN
ASSAR
THE RIDGE
EL GIR
DALA'EN NAHL
DELBI
MAFAZA
RUWINA
NAHL HILLS
ABU HAMIR
HAWATA
CALIPHA
H. SENEGAL
MUGDEIT
BEA
HUWEIG
DOKA
R. RAHAD
Railway.
Outcrops.
Main khors.
Modified from Physiographic Map.

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